FARM CHEMICALS

October Volume 123 No. 10 50 cents
Pioneer Journal of the Industry

"NAC in Action" stresses safety and public relations

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FRANK H. KENNEDY
is PCA's Sales Manager for the Midwest, with offices in Peoria. He is a graduate of the Catholic University of America, was a wartime naval aviator, and has broad experience in the plant food industry, having joined PCA in 1950.

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The national business magazine for the fertilizer and pesticide industries, FARM CHEMICALS, serves primarily those persons responsible for management, marketing and production. It has a qualified circulation for selected executive and supervisory persons within specified segments of these industries, as well as in certain closely allied fields. Subscription rates to all others are: in the U.S., its possessions, Canada, Cuba and Panama: $6.00; in other countries: $7.50. Current issue 50 cents. Back issues $1.00. (Current issues become back copies on the 5th of the month following publication.) Established in 1894 as *The American Fertilizer*.

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FARM CHEMICALS

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THE COVER PICTURE

Mr. Jack V. Vernon, Vice President, Food Machinery and Chemical Corp., New York, is shown outlining the plans of the NACA to Dr. Hector (Don) Lazo, Chairman of Marketing Dept., Graduate School of Business Administration, New York University. Dr. Lazo will be the moderator of FCMS to be held at the Delmonico Hotel in New York, Nov. 15-16, 1960. (*Farm Chemicals Photo.*)

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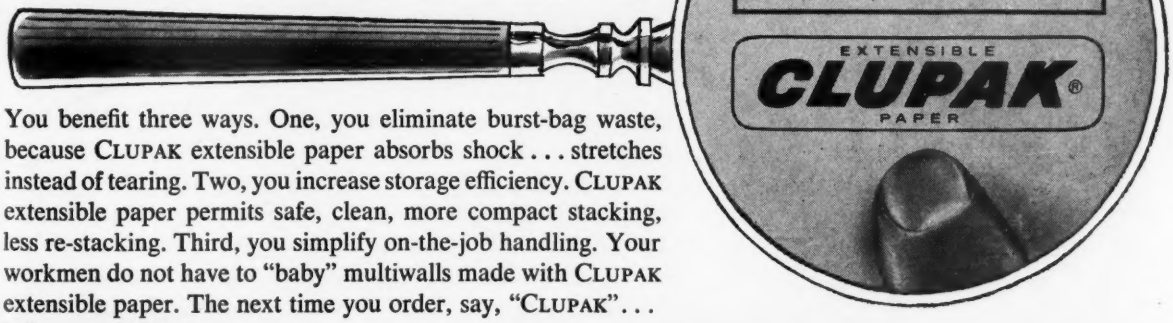

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Through the years, Witco research has made Emcol Emulsifiers increasingly attractive to formulators. Their excellent quality allows the use of reduced emulsifier levels. Their extreme versatility makes possible the use of but three Emcols to produce top-quality emulsifiable concentrates of a wide range of chlorinated hydrocarbon and organic phosphate toxicants. In addition, these emulsifiers produce concentrates which have excellent storage stability.

The many basic emulsifier patents held by Witco in more than 15 countries indicate the success of our research efforts in this ever-changing area of chemistry. Witco's technical service program makes available our extensive research facilities and highly trained specialists to help solve your formulating problems.

EMCOL	DESCRIPTION
H-300X H-500X	Emcol H-300X is balanced for toxicants in the lipophilic range (i.e., toxaphene and chlordane), while H-500X is ideal for more hydrophilic toxicants (i.e., DDT and BHC). Blends of this Emcol-matched pair produce superior emulsifiable concentrates with chlorinated hydrocarbon and organic phosphate insecticides.
H-710 H-712 H-714	Manufactured for use with 2,4-D and 2,4,5-T ester concentrates, at low levels, these products give low-foam concentrates outstanding emulsification and sludge-inhibiting properties.
H-140 H-141	Especially developed for use with Malathion, these Emcols may be blended with other Witco emulsifiers or used alone. H-140 produces excellent emulsifiable concentrates containing 5 pounds per gallon of Malathion (approx. 60% Malathion by weight). Emcol H-141 is recommended where levels of 8 pounds per gallon (approx. 86% Malathion by weight) are desired.
H-A H-B H-C	These unique Emcols make practical simultaneous application of a wide variety of liquid fertilizers—liquid pesticide mixtures. Such mixtures may be field-blended to give exactly the correct proportions of toxicant and fertilizer as well as correct dosages for particular crops.

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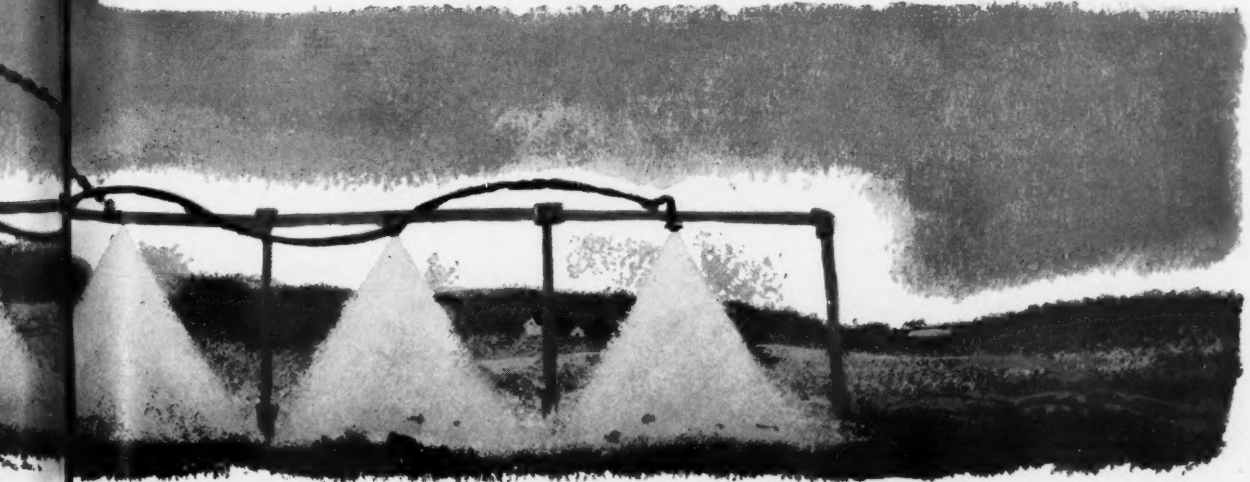


WHAT'S DOING IN THE INDUSTRY

F C

NATIONAL DISTILLERS—FEDERAL CHEMICAL CO. MERGER PROPOSED

A merger of Federal Chemical Co., Inc., a 76-year old, six-plant manufacturer of mixed fertilizers, with National Distillers and Chemical Corp., has been approved in principle by board of both companies. This was announced by John E. Bierwirth, chairman, and Roy F. Coppedge, Jr., president, of National Distillers and Jefferson D. Stewart, Jr., president of Federal Chemical.

National Distillers will offer about eight shares of its common stock for each outstanding share of Federal Chemical common stock and four common shares for each Federal preferred share. Federal has 20,000 common shares and 21,494 preferred shares currently outstanding.

Coppedge said that the merger with Federal will be an important forward step in the integration of National Distillers' fertilizer chemicals operation. Since 1950 the firm has been increasingly active in the manufacture of a variety of industrial chemicals, including such fertilizer raw materials as phosphoric acid, sulfuric acid, ammonia and nitrogen solutions.

After the merger is completed, Federal will be operated under its present name by its present management, officers and staff as a division of National Distillers. Headquarters will continue at Louisville, Ky.

Federal's plants are located in Louisville; Humboldt and Nashville, Tenn.; Danville, Ill.; Butler, Ind.; and Columbus, O.

DRI-DIE NOW AVAILABLE FROM FAIRFIELD CHEMICALS

Dri-Die silica dust insecticide now is available through representatives and nationwide sales offices of Fairfield Chemicals, Food Machinery and Chemical Corp. It is being offered alone or in combination with Pyrenone, Fairfield's insecticide base.

A finely powdered residual insecticide that eliminates crawling insects by dehydration, Dri-Die is a development of Davison Chemical Div., W. R. Grace & Co.

PHOSPHATE FOUND IN TANGANYIKA

A 10-million ton deposit of phosphate was recently discovered in northern Tanganyika, according to the Foreign Agricultural Service. The deposit is near a town called Arusha which is close to roads and railroads.

Development plans call for the processing and marketing of about 50,000 tons a year for fertilizer.

NEW REPELLENT FOR FACE FLY CONTROL

Face flies, plaguing dairy and beef cattle in most Northeastern and Northcentral states, now can be controlled, reports Union Carbide Chemicals Co. A new face fly repellent mixture has been introduced to farmers following successful on-the-farm tests in New York State.

The new material, G.L.F. Improved Face Fly Repellent, was formulated by Cooperative G.L.F. Exchange Inc., Ithaca, N. Y. It contains Crag Fly Repellent, combined with pyrethrins and piperonyl butoxide in a white mineral oil base.

The mixture is sponged or applied by paint brush to the face of dairy and beef cattle or horses.

ATRAZINE FOUND EFFECTIVE AGAINST QUACKGRASS

Research work at the University of Wisconsin by two agronomists, Dr. K. P. Buchholtz and Dr. D. R. Peterson, shows that the area of land infested with quackgrass in the northern United States is much larger than generally realized. These research workers presently have 100 different treatments on 300 test plots, and find atrazine herbicide extremely effective against quackgrass.

Where quackgrass is spread over the entire field, modified low or high pressure farm sprayers can be used for a broadcast treatment of 5 pounds atrazine 80W per acre in 20–30 gallons of water. In other fields, it may be sufficient to spot treat the quackgrass. In either case, the land should be planted only to corn the following spring.

Quackgrass should be growing actively at time of treatment in the fall so that the herbicide will be absorbed more readily by leaves and roots.

KAW SERVICE CHANGES NAME

Dean R. McHard, president of Kaw Fertilizer Service, Inc., Lawrence, Kansas, announces that the company name has been changed to Agricultural Business Company, Inc. New trade mark will be "Agri-Bizz" symbolizing a link between farm and industry.

Meeting Highlights

THIS MONTH:

Fifth Southeastern Fertilizer Conference

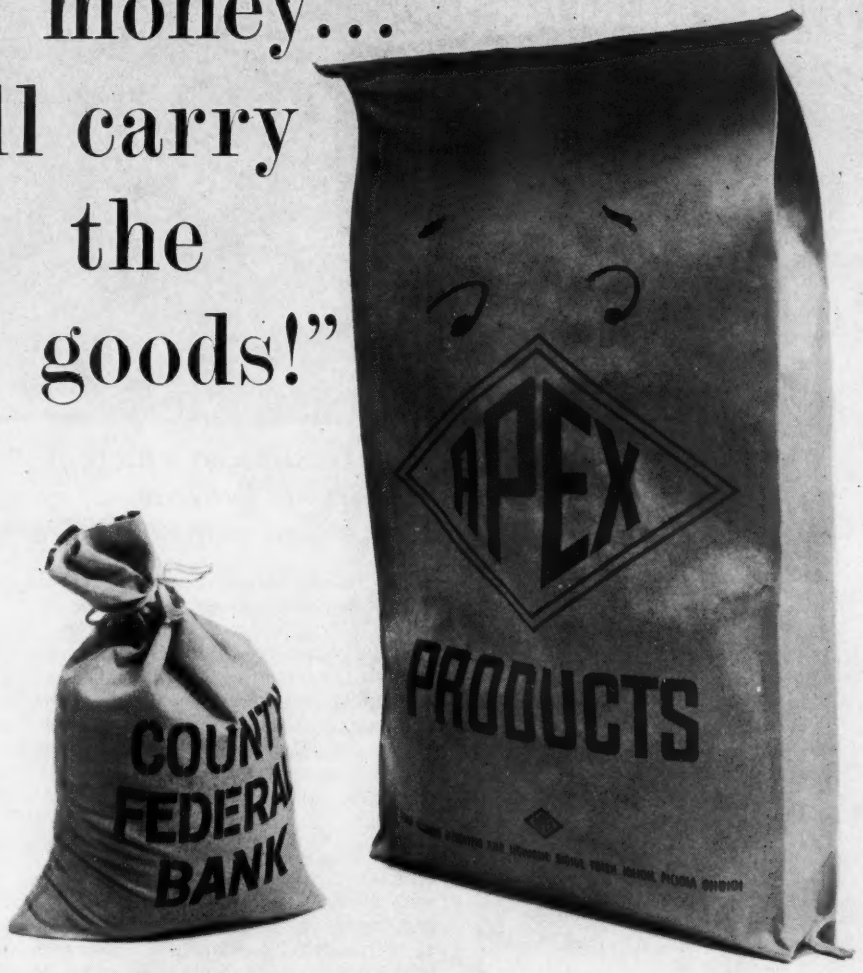
Biltmore Hotel, Atlanta, Georgia

October 5. A hospitality hour will be held in the evening.

October 6. Theme is "The Future for Farming and Fertilizer." R. L. Beacher, director, Southern Region, National Plant Food Institute, will welcome participants. "What Does Agriculture Need?" is the topic for a panel discussion. Presiding will be William Campbell, chairman of the NPFI Southern Region Industry Advisory Committee. Panel members and their individual topics include L. Y. Ballentine, Commissioner of Agriculture, North Carolina Dept. of Agriculture—"Is It Better Public Relations?"; Dr. Earl L. Butz, dean, College of Agriculture, Purdue University—"Is It Greater Production Efficiency?"; Donald R. Matthews, representative, Eighth District of Florida—"Is It Better Agricultural Legislation?"; and W. A. Sutton, director, Georgia Agricultural Extension Service—"Is It a More Intensive Farmer Educational Program?".

"What Is Industry's Responsibility for the Future of Agriculture?" will be discussed by Dr. R. Q. Parks, general manager, Nitrogen Products Div., W. R. Grace & Co.

"You tote the money... I'll carry the goods!"



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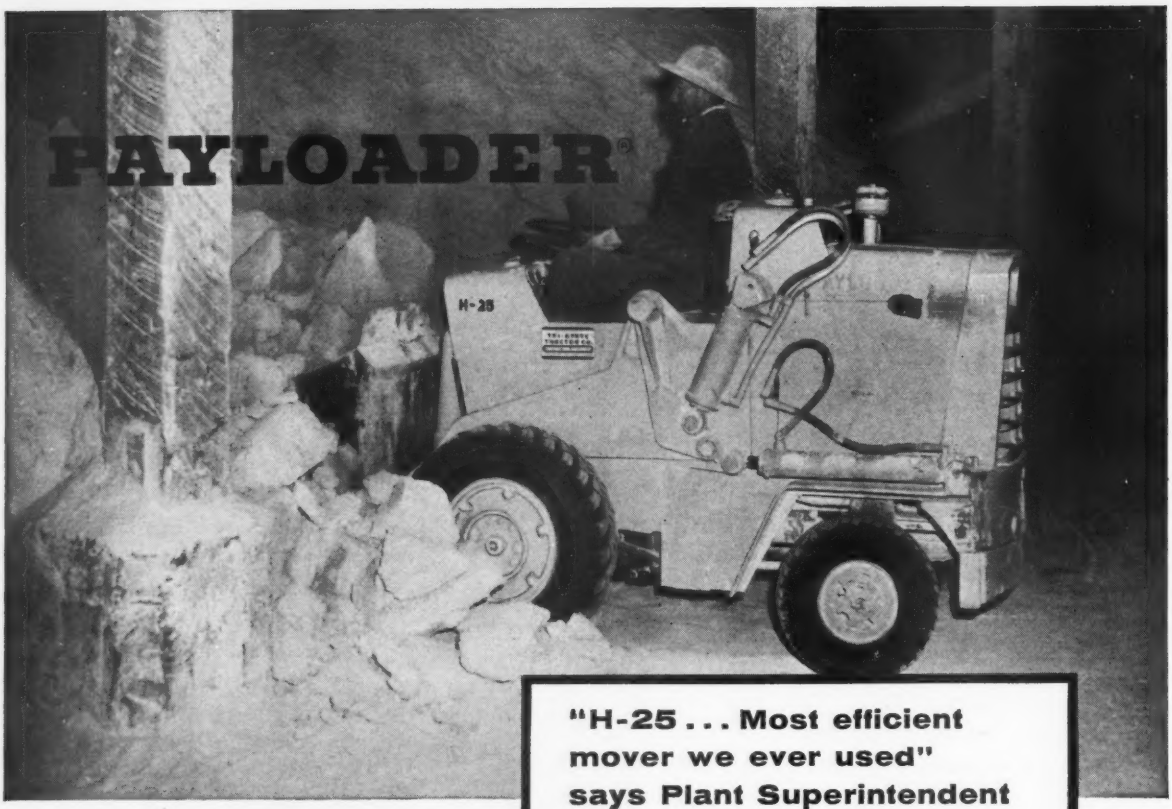

"H-25 . . . Most efficient mover we ever used" says Plant Superintendent

"The H-25 is easier to operate; has shorter turning radius and gives nearly twice as much output as our older tractor-shovels," says James C. Harnage, Plant Superintendent of Berrien Products Co., Nashville, Georgia. "It also spills less, keeps the floor cleaner, and maintains better working safety conditions. Digging traction is good and the lift is fast. It's proving to be the most efficient mover we ever used and is even outperforming larger movers".

Feeding 5-10-15 fertilizer from the stockpile on a 50 ft. haul, this H-25 is able to keep up with the full 1-ton-per-minute capacity of the bagging machine. The power-steer and power-shift transmission of the H-25 gives such ease of operation that an operator can maintain a fast, high-production pace the full shift without strain.

Whether your bulk-handling needs require the Model H-25 with 2,500 lb. operating capacity, or a larger tractor-shovel up to 12,000 lb. operating capacity — you'll find a "PAYLOADER" is the standard of *any* comparison. Your Hough Distributor is ready to prove it, and has the finest service and parts facilities in the business, backed by Hough factory service personnel.

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LETTERS

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We would like to receive 12 reprints of your article "Organize Your Time" . . .

J. C. O'CONNER
Assistant Div. Manager
THE BEST FERTILIZERS CO.

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Please send the following reprints from your August Volume 123 No. 8.
4 each Organize Your Time
4 each Sell a Mental Concept
4 each Reaching the Middle Market.
If we cannot obtain reprints in this manner, please send four copies of the entire August issue.

Also, in the future, please send publications of FARM CHEMICALS to our division offices . . .

Very truly yours,
FRANK D. KELLEY
Secretary
MID-CONTINENT
AERIAL SPRAYERS, INC.

PRAISE FOR DICTIONARY

Windermere, Fla.

I have the pleasure of being a recipient of one of your publications which you can rightfully be proud of, and I would like to order one dozen copies at this time. Reference is made to your "Dictionary of Plant Foods." . . .

Yours very truly,
JEFFERSON B. HUPPEL
Citrus Advisory and
Management Services

New York City

We are desirous of obtaining information on the number and location of liquid fertilizer plants throughout the country; also, some similar information with respect to manufacturers of such plants.

We would be very appreciative if you could suggest sources of such information to us—or, in the event you could provide us with some of the information direct, we would be very grateful.

Yours very truly,
S. S. ORBEN
Manager, Merchandising Div.
General Sales Dept.
INGERSOLL-RAND CO.

Durban, South Africa

With interest, we read an article in FARM CHEMICALS, July, 1959, on the use of metal chelates in fertilizers.

We would be obliged if you could advise us how we could get in touch with the manufacturers of metal chelates as the calcium, magnesium, manganese, cobalt, iron, zinc and copper derivatives.

We would appreciate receiving samples of these derivatives by airmail to carry out experiments with concentrated fertilizers.

Yours faithfully,
S. P. LIGTHELM
Technical Officer
FISONS (PTY) LTD.

The newly-issued 1960 FARM CHEMICALS HANDBOOK *contains information sought by both Mr. Ligthelm and Mr. Orben. Copies of the 380-page volume are available at $15 each from* FARM CHEMICALS.

The Management Triad

NPFI PUBLISHES BOOKLET ON TREE FERTILIZATION

"How to Fertilize Trees and Measure Response" is the title of a new booklet just published by the National Plant Food Institute in cooperation with the University of Washington.

The authors are nationally-known men in the field of Forestry —Dr. Stanley P. Gessel, associate professor of forest soils, School of Forestry, University of Washington; Kenneth J. Turnbull, instructor in forest mensuration, School of Forestry, University of Washington; and F. Todd Tremblay, Pacific Northwest regional director, National Plant Food Institute.

Designed for use by forest landowners and managers, it is intended to furnish forest tree fertilization information to these people and to help them "demonstrate whether or not wood production can be increased profitably on their own forest holdings "

Copies may be obtained from the Publications Division, NPFI, 1700 K Street, N.W., Washington 6, D. C., or from Dr. Stanley P. Gessel, School of Forestry, University of Washington, Seattle, at 50 cents each, plus shipping charges.

FORECAST FOR FAMILY FARMS OF 1975 MADE BY ECONOMIST

Family farms of 1975 will be even more specialized than at present, but they will continue to dominate most types of farming, a USDA economist predicts.

H. L. Stewart, of USDA's Agricultural Research Service, says average size of family farms will continue to increase, and total number of farms will decrease.

He foresees an increase in the present trend on farms to adopt labor-saving and output-increasing improvements essential to economic survival in competitive farming.

Farmers of 1975 will employ others to perform more services formerly performed by farm operators themselves, Stewart said. Among these new services he lists increases in spraying, dusting and fertilizing, and more professional management assistance and help in buying and marketing livestock.

WASHINGTON VIEWPOINT

▶ *Farmers are harvesting the biggest total volume of crops in history. Farm income during the first half of '61 is expected to be 5-6% more than forecasts for '60.*

▶ *Both presidential candidates have come out with much of the same kinds of programs, with the difference primarily one of degree.*

Farmers will be better customers during the next 10 months than they've been since last fall. They now are harvesting the biggest total volume of crops in history, which means money in their pockets—if prices hold up under the heavier marketing weight. And the outlook on prices is that they WILL hold up because of bigger domestic and export demand for farm commodities. Also, while record total production is being harvested, surplus additions will be avoided in most cases because the balance of production as between crops is more closely aligned with demand than in many previous years.

Farm income during the first half of 1961, as a consequence, is expected to run at a level about 5–6% greater than income forecasts for 1960. This will result from an increase in the average commodity price level of about 4% multiplied by the larger production. An improved outlook in the livestock sector of the farm industry gives added oomph to the upward trend.

It means farmers will be more optimistic and will be able to pay off debts better then during the past year, and will show a greater willingness to increase spending and borrowing for production items. It does not mean a boom in farm sales—but a small boomlet after the past year's dismal performance is entirely possible.

But the boomlet may not last beyond next summer. The best indicator to help determine what farm income and spending is likely to be after the summer of 1961 is the livestock economy, which provides three-fourths of annual farm income. An overproduction of hogs from a vastly expanded 1961 spring pig crop could well coincide with a further reduction in cattle prices. Simultaneous weakening in hogs and cattle could touch off a recession in agriculture starting a year from now. It could herald another year such as 1959 or worse. Actually, prospects at this point are hopeful that this may be avoided—but it depends mostly upon how farmers market their livestock next fall, and whether we will get a drought in the range country. It is something to bear in mind while planning sales to the farm market through the next year and a half.

A permanent upswing in the farm economy is not likely to follow the rise in 1961. Agriculture Department economists believe that 1961 will be only a bulge in the long term trend line. They note that aside from the boomy year of 1958, farm income has been "quite stable" for the past 6 or 7 years, ranging between $11 billion and $12 billion net income. They believe that this stability within the $11–$12 billion range will continue to be the rule. With more farmers going out of production, however, this level of income looks better every year to industries selling the farm market—for it is being concentrated in fewer hands.

Basic financial structure of farming is undergoing a subtle change, and some ominous signs are showing up—although they may disappear following another reasonably good income year. The Agriculture Department's Balance Sheet of Agriculture, which treats farming as a single industry, points up some significant trends for industries selling the farm market. Here are the significant highlights:

The Steady long-term rise in farm asset valuation came to a grinding halt in 1959. As of January 1, 1960, farm assets increased less than 1% over the previous year. This contrasts with increases in farm assets of $16 billion in 1958, $10 billion in 1957, and $8 billion in 1956. Assets stand at $203.6 billion. The reason for a halt in valuation is the fact that real estate values have shown little rise over the past year following 5 years of straight increases.

Farmers' equities in their properties also showed little change from a year earlier. Equities stand at $179 billion. This contrasts with increases of the previous three years of $7½ billion, $9 billion, and $13.2 billion, respectively.

Farmers increased their indebtedness to maintain their equities. Farm debts rose about 4% during the year. This, however, was considerably less than the 15% increase during 1958. Smaller debt rise is attributed to the fact that 1958 was a relative boom year and 1959 was a poor income year.

Of major interest is what is happening to farmers' liquid assests. For the first time in 10 years, farmers holdings of deposits and currency were reduced substantially during 1959. Farm bank deposits, currency and U.S. savings bond holdings dropped about $1 billion from the year before. These assets now total an estimated $14.3 billion. Two-thirds of the decline was in farm checking accounts, and the Federal Reserve System estimates that the average size of farmers checking accounts decreased by about 7%. No economist at the USDA is willing to predict that the improved income prospects for 1960–61 will be sufficient to help farmers replace liquid assets eroded last year.

What is the difference in presidential candidates in terms of the kind of programs they will push if elected in November? The more we study them the more we can see little difference in what they might accomplish by way of new legislation. Both candidates have come out with much the same kinds of

What's Coming Next Month

Products, materials, situations and people . . . all have been exposed to objections from time to time.

Do we tend to let these objections disturb us?

It is only natural that we react in some way to ward off the sting that always comes with a protest.

Who are the people that voice these protestations? More likely than not the furor is raised by a prejudiced minority group or individual not entirely versed on the necessary facts and figures.

Currently the NAC, the stalwart of the agricultural chemicals industry, is facing up to a situation that seems to blow hot and cold. An excellent job is being done by this organization to allay the fears that have developed.

Yes, it is fear because objections often come from fear . . . fear of the unknown.

Objections do not limit themselves to situations such as the "pesticide scare" but to other areas as well.

■ OBJECTIONS INTO SALES

Merrett, our salesense author, says to stop letting objections shake you up. Learn to welcome them. Next month we will have a complete analysis of objections, where and when most of them come and how and when to answer these protests.

■ HOW TO MEASURE PROFITS

Set up a *system* and a secretary can do the bookwork! That's the advice of a successful dealer who has learned the secret of measuring profits. What are his tools? What are the norms—the standard operating ratios you should follow—to make a reasonable profit? This article should help *you*—as well as your dealers.

■ NAC MEETING

Look for the complete discussion of the National Agricultural Chemicals Association meeting being held at Coronado, California.

WASHINGTON VIEWPOINT

programs, with the difference primarily one of degree. This holds true pretty much across the board.

In terms of new legislation, it is well to keep this in mind: Laws finally enacted will depend more upon the mood of Congress than upon who becomes President. And the mood of Congress next year, as it has been during the past 8 years, is one of conservatism. This is true despite the prospect that both Houses once again will be controlled by the Democrats regardless of which presidential candidate wins. And the dominant roles in Congress, committee chairmanships and the like, are occupied by Southern Democrats. In our view, this means that Kennedy would have a difficult time of getting his "liberal" programs adopted, and Nixon would have equal difficulty on grounds that Democrats instinctively would oppose his proposals. In essence, we would look for the "first 100 days" of the new Administration to be loaded with new proposals, but would anticipate that very little of a drastic nature actually would be enacted by the Congress.

Turning to agricultural legislation, and what might be done next year. We would anticipate that something would be done on wheat regardless of who occupies the White House. Furthermore, we look for an increase in the amount of land to be retired from active crop production starting in the 1961 crop year. We also expect that crop controls and higher price supports will be advocated by the new President, whoever he may be. While Kennedy would go back to 90% of parity supports, with tough controls on bushels, bales and pounds, Nixon insiders confide that they would also offer higher supports (although not up to 90%) in exchange for smaller production allotments. In both cases, farmers would have a chance to vote on the tighter production restrictions. If they vote them down, then there would be no program for the specific crop in question.

It will come as no surprise that both candidates advocate essentially the same type of program—only differing in degree—when it is known who the men behind the candidates are. The brains behind the candidates on farm issues are primarily Land Grant College extension officials.

Kennedy's chief farm advisor is Dr. Willard Cochrane of the University of Minnesota. He lays the emphasis on improving farm income immediately by direct action of the government. He is an advocate of removing land from production as a means of shrinking the production base.

One of Nixon's chief farm consultants is Henry Ahlgren, associate director of Extension at the University of Wisconsin. Ahlgren believes that the government should gradually get out of farming and in this agrees with Benson—but that the government must take certain immediate steps to make the transition less difficult. He also believes in a bigger soil bank.

The common denominator between the two men is an increase in the amount of land retired from production. This approach finds the greatest support now-a-days on the campuses of our great Land Grant Colleges.

MICRONIZED

TRI-BASIC COPPER SULFATE

Copper fungicides offer many advantages—**Tri-Basic Copper Sulfate** can be used in spray or dust form on practically all truck crops and many fruit crops in the control of persistent fungus diseases—It is compatible with other pesticides and gives the added advantage of correcting nutritional deficiencies where there is insufficient copper in the soil.

Tennessee's **Tri-Basic Copper Sulfate** is micronized to a mean particle size of 0.5 micron to give greater covering power—It is guaranteed to contain 53% copper as metallic.

Insist on TC Micronized Tri-Basic Copper Sulfate

For samples or literature, make request on your firm's letterhead.

TC TENNESSEE CORPORATION

TENNESSEE CORPORATION
612-629 GRANT BUILDING, ATLANTA 3, GEORGIA

J. L. Whitten

H. B. Jones

A. M. Boyce

H. van Zile Hyde

Jack Dreessen

SAFETY and PUBLIC RELATIONS

are stressed by the NAC Association at its 27th annual meeting in Coronado

MORE than 350 officials and representatives of pesticide manufacturers were expected to be on hand for the 27th annual meeting of the National Agricultural Chemicals Association at the Hotel del Coronado in Coronado, Calif., September 27–29.

Speaking at the luncheon session on the first day of the meeting, The Honorable Jamie L. Whitten, Congressman from Mississippi, presented his views on some of the broad farm issues of the day. He also discussed the vital role played by chemicals in production of the world's food supply, and the relationship of pesticides to both agricultural production and public health.

At the opening session, following an address by the NAC president, Jack V. Vernon, vice president of Food Machinery and Chemical Corp., the group heard Dr. Hardin B. Jones, assistant director of the Donner Laboratory of Medical Physics of the University of California at Berkeley, discuss "The Reasonable and the False Issues of Carcinogenicity." Dr. Alfred M. Boyce, director of the University of California's Citrus Experiment Station at Riverside, spoke on the safety of pesticide chemicals.

Importance of pesticides to world health programs was discussed by Dr. Henry van Zile Hyde, chief of the Division of International Health, U. S. Public Health Service, Washington, D. C.

"Public Relations in the Sixties" was discussed by a panel during the afternoon session the first day. Moderated by Jack Dreessen of the NAC Association staff, the panel included George K. Johnson of Monsanto Chemical Co., St. Louis, Mo., who spoke on industry's public relations responsibilities; Wally Erickson, radio farm director of Station KFRE in Fresno, Calif., who discussed the aspects of disseminating agricultural news to the public by radio; Jack T. Pickett, editor of the *California Farmer*, San Francisco, Calif., who presented the views of the agricultural press on how to hold public opinion; and Donald G. Lerch, Jr., of Washington, D.C., who spoke on the importance to the industry of planned public relations programs.

Association members and their guests attended a reception and water show during the evening.

Second day of the meeting was given over to the annual golf tournament and annual banquet, with numerous committee meetings scheduled for the final day of the meeting.

A special report on the meeting, complete with pictures, will appear in the next issue of FC. ▲

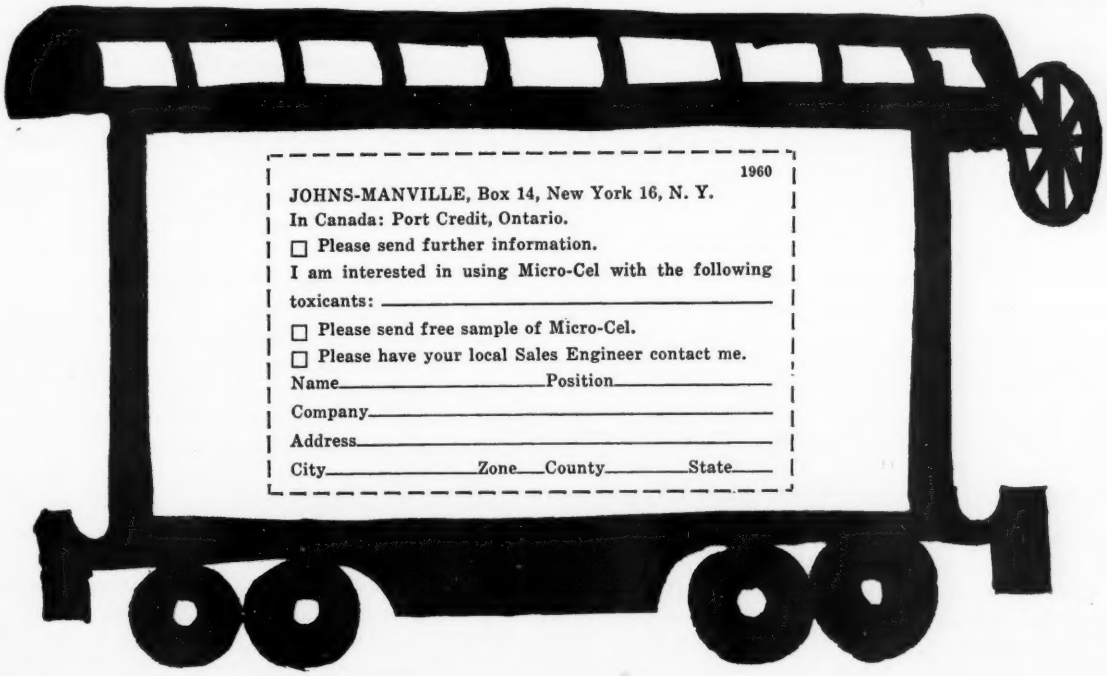
Electron micrographs showing plate-like Micro-Cel E and spherical Micro-Cel B structures.

1μ

Ship more toxicant per carload with Micro-Cel!

Micro-Cel®, Johns-Manville's inert synthetic calcium silicate, permits 75% DDT concentration. Other freight-saving, high toxicant concentrations include: 50% Chlordane, 70% Toxaphene, 50% Heptachlor, 75% Aldrin and 50% Aramite. Micro-Cel's unique structural characteristics (surface areas up to 175 sq. m/gr) reduce caking, improve flowability, increase suspendability and extend shelf life. For further information, samples and technical assistance, mail in the coupon below!

JOHNS-MANVILLE JM
Celite Division



1960

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☐ Please send further information.

I am interested in using Micro-Cel with the following toxicants: _____

☐ Please send free sample of Micro-Cel.

☐ Please have your local Sales Engineer contact me.

Name_____ Position_____

Company_____

Address_____

City_____ Zone___ County_____ State___

Sixth article in FC's Salesense Series

By O. C. MERRETT

IF I HAVE ever earned the right to talk with you about subject, I have earned the right to talk with you about this one. Playing with price cost me a $5,200.00 contract two and a half years ago.

We had a sales trainee working for our company who had been a sales manager for another company. He wanted very much to become a sales trainer. He met all the qualifications and we hired him.

He went with me to call on the president of a small chain of department stores. This president was most interested in our program. I filled out the contract, which was for $5,200.00, and asked him to approve it by signing his name.

He said, "Merrett, I like your program. I want your program, and I will approve this contract with one provision."

"What is the provision?" I asked.

He said, "I have a silent partner I will have to talk this over with first."

I asked him when he would talk it over with his partner. He promised he would talk to him that evening and call me the next morning at 9:30.

Now, I knew the oldest put-off objection in selling is "I'll talk it over with my partner," but for some reason I felt as though this were not a put-off.

He signed the contract and I left a copy with him. I told him I would pick up his check the next day if his partner agreed. He said, "That will be fine."

The next morning at 9:20 A.M. this man called and said, "Come pick up your check. We have decided to take your program."

I was busy with another prospect in the office at the time. Since the sales trainee was with me when I made the presentation, I asked him to go pick up the check. When he walked into the president's office, he told him he had come to pick up the check. The president opened his check book and started to write the check.

He asked the sales trainee, "How much did Merrett say this would cost me?"

The salesman said, "Oh, not all that much. For a man with *your money*, it's so little, you'll never miss it! Just $5,200.00."

The president closed his check book and said, "Tell Merrett I have decided not to take the program."

After explaining to me what happened, the salesman asked me if I knew why the man backed out.

"I sure do," I replied. "You played with price. No business man likes to kid around with price . . . whether it be $2.00 or $5,200.00."

I went back to see if I could explain the salesman's mistake away, but he said, "Merrett, if that is the way your course trains people to quote price, I don't want any part of it." He meant it, because he would not change his mind. As badly as I hated to, I could not help but agree with him.

All the salesman needed to say was, "Five thousand two hundred dollars."

How many times have we all heard the following expressions when we ask, "How much is it?"

"Now here is the bad news" . . . "That's the part I hate to tell you" . . . "What difference does it make? It will pay for itself in sixty days" . . . Oh brother, that one gives the buyer a perfect answer: "Bring it back in sixty days after it has paid for itself and I'll take it!"

There are many, many more, such as the classic "I'm glad you brought that up . . . " But all these answers to price are *sales killers!*

When quoting price, you will find it helpful not to hesitate after you quote the price. When you hesitate, you allow your prospect to start thinking of what it will cost him . . . instead of what it will do for him.

HERE'S WHAT YOU SHOULD SAY

When you quote price, always quote profit, or stress benefits behind the quoted price. For example:

1) Your cost, Mr. Prospect, $6.00 per case; your profit, $3.00 per case.
2) I've good news for you. It will only cost you $90.00 per ton and here is what it will do for you: It will increase your yield per acre. It will reduce your labor, which will reduce your cost . . . thus giving you more net profit.

One of the finest ways I have seen yet for quoting price, is to sandwich the price in between two *big, fat benefits.*

A few examples:

1) This applicator will save you $200.00 each year Mr. Farmer, and for only $825.00 you can apply your anhydrous ammonia when it is most convenient for you.

2) Anhydrous ammonia will cut your labor expense in half . . . and for $120.00 per ton, you will enjoy a total saving of $450.00 on your fertilizer bill.

3) With this quick-hitch attachment, you can attach this XX applicator to your tractor in 10 seconds. It costs only $465.00 . . . and when you apply liquid mixes, it will attach to your tool carrier.

Now, if you are like most salesmen, you have several questions you would like to ask me. I will ask them for you:

"HOW MUCH IS IT?"

What do you do with the fellow who says just as you sit down, "O.K., let's have it. Give it to me in a nutshell. How much is it? I am a busy man."

Don't do it! This buyer knows what he is doing. He knows if he gets you to quote your price, he can say, "I am sorry, I am getting a better price now. Goodbye!"

When you quote price to this type buyer, you are either *in* or *out*. If your price is less, you might get to stay; if it is more, you are out of the sale. Smart buyers use this method for checking salesmen. They like to do business with a good salesman, and they know if you quote price to this type of question, you are not.

You might want to try this answer:

"You know, Mr. Farmer, that's exactly why I am here today. We know you are a busy man, and we want to save you some time. Now, what you really want to know is: How much will it save you, and how it will do it? Isn't that right?"

If this won't work, try this:

"Mr. Farmer, I didn't just happen to come by to see you. I have a special reason for calling on you today, and what I have to show you *means too much to you* for me to have to rush this demonstration. Since you are busy today, I would rather set up a definite appointment with you when you are not so busy, so I can show you exactly how our product will save you labor, time and money. Would 9:00 A.M. tomorrow suit you better?"

Eleven times out of thirteen, he will say, "Oh, go ahead and show me now."

Let me repeat . . . Whatever you do, *don't* go for his nutshell gag. If you do, you are going to lose.

How do I keep from giving out price until after I have given enough benefits that price will not matter?

Work out a compelling attention getter and convert it into his interest immediately.

Stay away from the trite. Remember he has heard all the old attention getters. Use something new and different.

I shall never forget how a book salesman got by my wife a few years ago. He rang the doorbell and when Marteal opened the door, he said, "Mrs. Merrett, you should have seen what I just saw next door. May I come in and tell you about it?"

Before she thought, she said, "Please do!"

What shall I do when he says, "Your price is high?"

"Yes, our fertilizer is a little more expensive, and here are the reasons: No. 1..... No. 2 ..... No. 3....." Tell and show him why by pointing out the different advantages your product or service offers.

Whatever you do, don't duck your head when he says, "Your price is high." Be proud of it, and tell him why.

Don't worry about your competitor's product's having the same benefits. The thing you want to keep in mind is that nine times out of eleven, your competitor is selling facts or comparative benefits . . . and not stressing the various benefits.

What shall I do when he says, "Your price is TOO high"?

This is a tricky one. I saw a chemical fertilizer salesman walk head on into this trap a few months ago.

This salesman was in the habit of using the old "Yes, but". Everytime his prospect would state an objection, he would say, "I agree with you, Mr. Farmer, but let me call your attention to this."

Finally, the farmer asked for price. The salesman quoted it.

The farmer said, "You are too high!"

The salesman said, "I agree with you, but . . . "

That was all. The farmer stopped him and said, "Now wait a minute. If you agree that your price is *too high*, then it's *too high*, and I am not going to buy it."

So remember . . . There is a lot of difference between *High* and *Too High*. You can explain away *high*, but you can't explain *too high*.

You might want to try this answer:

"Mr. Farmer, what you are really asking me is whether you are going to get your money's worth from this anhydrous ammonia, aren't you?"

What do I do when he says, "I can get it cheaper?"

"Yes, I am sure you can, and here is why:....." (Give him the reason).

NOTICE: Be sure you have a reason. One salesman using this method said, "I am sure you can, Mr. Farmer, and here is why . . . "

After waiting for the salesman to give the reason, the farmer said, "Well, what is the reason?"

The salesman's mind had gone blank. He said, "I hate to tell you this, but I don't know."

Maybe you like this answer better:

"Our company knows about the fertilizer you are talking about, but we don't make it. Chances are, if we did, our price would be as low as theirs. They don't make or handle our fertilizer either, and if they did, their price would have to be as high as ours. Now, let's look at all the differences our fertilizer offers . . . "

How many times should I let my prospect ask for price before I quote it?

The answer to this question depends upon how good a salesman you are.

We believe that if you don't give your prospect the price the second time he asks, he loses faith in you.

(*Continued*)

He begins to think there must be something wrong here.

How do you turn price into a close?

The minute your prospect asks for your price, let it be a signal for you to start closing. For instance:

FARMER: What's your cost per ton?

SALESMAN: Let's see, now. You'll want this delivered tomorrow, and you will need a tank. We can do that all right. It will be $120.00 per ton. Will there be someone here at 8:00 A.M. to receive it?

"LESS EXPENSIVE" . . . NEVER "CHEAP"

Should I ever say my product is cheaper?

Nothing you sell should ever be cheap. I would never use the word "cheap" or "cheaper". Use "less expensive". When your price is higher than your competitor's, there must be a reason . . . and you had better know the reason, or you will find yourself in trouble. The same thing goes if your product is less expensive. There has to be a reason, and it's important to you to *know* the reason.

If my product or service is less expensive, should I tell him so?

Yes, by all means, but tell him why it's less expensive, so he won't think there is something wrong with your product.

What do I say when my prospect says, "I can't afford it right now?"

"That's one of the outstanding features about this applicator, Mr. Farmer. It starts paying for itself the minute you start using it by reducing your labor, saving you time, and cutting your cost.

Some of the more experienced salesmen use: "Mr. Farmer, you can't afford *NOT* to buy it now, and here is the reason I say that . . . "

If I sell the exact product as my competitor, and he is allowed to cut price while I am not, what can I do?

Sell your service.

If I sell the exact product as my competitor, and he offers the same service as I do but is allowed to cut price while I am not, then what can I do?

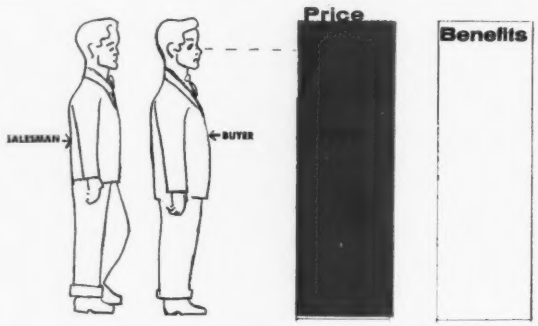
Sell yourself.

If I am allowed to cut price, and I can get a big account by doing so, should I cut the price?

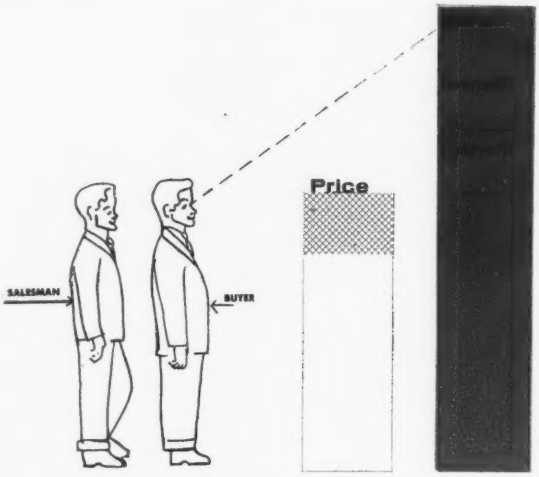
This certainly depends on the company you are calling on. We have found that most of the time it is bad business to cut prices. If a buyer will give you his business on price-cutting alone, he will give it to somebody else, taking away from you, the minute they cut your price.

Let's look at it like this: Anyone can cut price . . . You don't have to be a salesman to cut price. The cold hard fact is that you are not a salesman if you are a price-cutter. If you will remove the price from the prospect's eye and let him see the benefits, you won't have to cut price.

For example, in the little drawing shown, the salesman has the buyer's benefits completely blocked out with price.



Now, this salesman can do one of two things: He can lower his price, cut his commission, and cut his company out of its profit; or he can raise the different benefits to where the buyer won't see the price, thus saving his commission and his company's profit.



SUMMARY:

1) Don't play with price.
2) Profit should follow price as surely as September follows August.
3) Place your price between two benefits.
4) Your cost should never outweigh your benefits.
5) Get your prospect to consider value before he considers price.
6) Don't go for the *Nutshell Gag.*
7) If your price is more, tell him *why;* if it is less, tell him *how and why.*
8) Don't be a price-cutter.

Remember these few words . . . A buyer doesn't like a price-cutter; he only uses him. A price-cutter is an ordertaker, not a salesman, and your company can let the porter go around and take orders. ▲

HIS BUSINESS IS MAKING YOUR BUSINESS BETTER

Like all the men and women in Cyanamid's phosphate operation, his only business is phosphates for your mixed fertilizers

He's one of several hundred Cyanamid people who mine, process, research, deliver and service phosphatic materials for your acidulation and mixed fertilizer business. These people put Cyanamid's more than 40 years of phosphate experience into products and services you can use.

Services you can use

Traffic Service: Cyanamid traffic specialists are ready to route and ship your orders without delays. Their knowledge can save you money and can make your operation run even more efficiently.

Technical Service: Cyanamid's staff of technical experts are on 24-hour alert. Often, what are new problems to you are solved problems to them. Make your formulation and production problems theirs. That's their job.

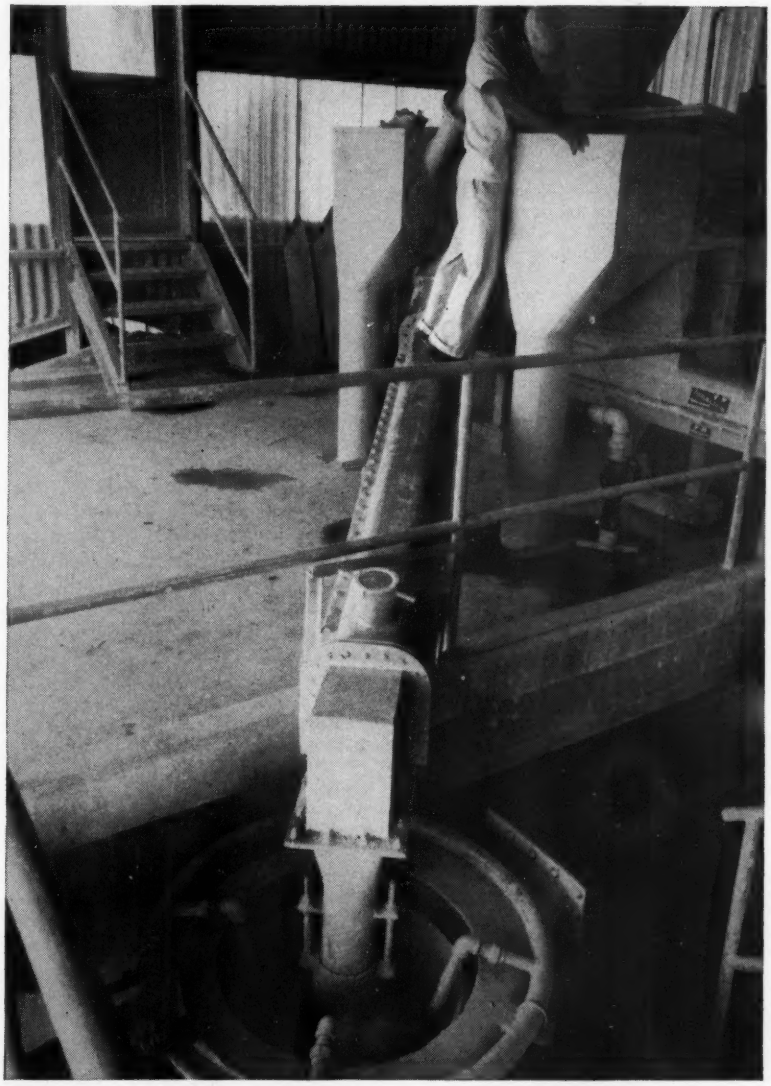
Sales Service: Cyanamid sales representatives are available to work with and for you in expanding present markets or in establishing new markets.

Products you can use

Cyanamid's only phosphate business is manufacturing the highest quality products for your mixed fertilizer requirements.

- Florida Natural Phosphate Rock.
- TREBO-PHOS® — Triple Superphosphate.
- Phosphoric acid for acidulation.

American Cyanamid Company, Agricultural Division, N. Y. 20, N. Y. *®TREBO-PHOS is American Cyanamid Company's trademark for its triple superphosphate.*



This Cyanamid technician is checking the flow and quality of phosphate rock just before it goes into the cone where it is mixed with phosphoric acid to make Trebo-Phos Triple Superphosphate.

CYANAMID

PHOSPHATE PRODUCTS

CYANAMID SERVES THE MAN WHO MAKES A BUSINESS OF AGRICULTURE

ORGANIZING for n

Theme for the Second Farm Chemicals Marketing Seminar to be held Nov

HECTOR LAZO is chairman of the Marketing Department, Graduate School of Business Administration, New York University, and managing director, Marketing Counsellors, New York. He spent six years with General Motors, at home and abroad, as manager of advertising and sales promotion; ten years as vice president and president, Cooperative Food Distributors of America; nine years as assistant to the president and director of marketing and public relations, Sunshine Biscuits, Inc. He is author of six books in the field of marketing, the most recent of which, "Management in Marketing" is due for release in November by McGraw-Hill.

EUGENE B. MAPEL has long been known as a well informed and articulate spokesman for the application of modern marketing principles to the fields of industry and finance. As vice president of The Chase Manhattan Bank, one of the world's largest banks, he is responsible for directing their marketing services activities in 133 offices in New York, in districts throughout the United States, and in their offices around the world. He was, for many years, an executive with Carnegie Illinois Steel Corp. (now United States Steel Corp.) as director of administrative planning. He left to serve as vice president of Barrington Associates, New York management consulting firm, before assuming his present position. He is a past director of National Sales Executives and has served as a director of a number of the nation's firms.

MEETING HIGHLIGHTS

Tuesday

9:30 A. M.

Welcoming Address

Aims and Purposes of the Meeting
HECTOR LAZO, MODERATOR

The Principles of Marketing Organization
EUGENE B. MAPEL

Coffee Break

How Monsanto Applied Those Principles
JOHN L. GILLIS

Question and Answer Sessions

12:30 P.M. Luncheon

2:00 P. M.

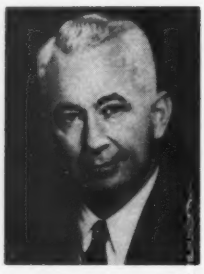
Policy Considerations and Decisions
HENRY BUND

Niagara's Experience in Policy Formulation
STUART H. BEAR

Coffee Break

Question and Answer Sessions

5:30 P.M. Informal Reception



JOHN L. GILLIS is vice president of marketing for Monsanto Chemical Company and a member of the firm's board of directors and executive committee. A graduate of Washington University, St. Louis, with a BS degree in business and public administration, he joined Monsanto in 1933 and served as export manager and later as director of the former Foreign Department. Gillis was named general manager of the company's former Merrimac Div. at Everett, Mass., in 1949, became a vice president in 1950, and general manager of the Organic Chemicals Div. in 1951. In 1953, he was named vice president of marketing. Gillis is a member of the board of directors of Mobay Chemical Co., a joint subsidiary of Monsanto and Farbenfabriken Bayer of Germany and is a member of the board of directors of The Chemstrand Corp.

DR. HENRY BUND, vice president of the Research Institute of America, has established a reputation as one of the most reliable economic forecasters in the United States. During the past 10 years, his second major preoccupation has been the rapidly developing changes in marketing. In addition to a major study on the subject, published early in 1957, he has lectured widely and consulted on the management implications of the new marketing function. As director of the Division of Management Methods, Dr. Bund is responsible for a substantial part of the advice which flows from the Research Institute to more than 30,000 member business concerns. He holds degrees in economics, law and business administration from the University of Vienna. Before the United States entered World War II, he was economist and secretary to the Rockefeller Research Project on Management Controls under War Conditions.

marketing ACTION

held

November 15 and 16 at the Delmonico Hotel, New York City.

Wednesday
9:00 A. M.
Staffing the Marketing Organization
DON SCOTT
Coffee Break
Staffing the Marketing Organization *(Continued)*
LOUIS B. BACKER
Question and Answer Sessions
12:30 P.M. Luncheon
2:00 P. M.
The Staffing Program at Calspray
M. E. WIERENGA
Question and Answer Sessions
Coffee Break
Summary and Conclusions
HECTOR LAZO

Registration: Fee is $40.00 per person, which includes two luncheons, the informal reception, coffee breaks, a copy of the complete proceedings plus additional copies at the special discount price of $1.25 per copy. To assure preferential handling, hotel reservations should also be made through FARM CHEMICALS. *For further information or to register, please contact FCMS,* FARM CHEMICALS, *317 North Broad Street, Philadelphia 7, Pa.*

DON SCOTT, Don Scott Associates, studied accounting at St. Johns University. He gained his industrial experience working 16 years for Texaco. During that time he was instrumental in establishing marketing and management development programs in Latin American subsidiaries as well as training Texaco people in the United States. In 1954 he started his own company. Since then, he has developed personnel or consulted for more than 300 companies. He has worked closely with some of the larger universities in management development and psychology. Though his business was started with the objective of helping smaller companies, his experience has made him and his staff a valuable asset to many larger corporations as well. He is author of a recent series of articles, on personnel problems, which appeared in Sales Management magazine.

LOUIS B. BACKER, who is on the staff of Don Scott Associates, graduated from Manhattan College with a B.S. degree in engineering and received a Master's degree in Architectural Engineering. For 13 years he was instructor and assistant professor at New York University. Backer has 14 years industrial experience as administration manager in development engineering laboratory, service manager and manager of training and development for a company with 39 divisions and subsidiaries. He has been in private consulting practice, preparing, giving and reporting on courses in management, sales, cost control, including work simplification, safety, and all types of supervisory training.

M. E. WIERENGA is vice president and a member of the board of directors of California Spray-Chemical Corp. He serves as manager of the firm's Marketing Department, originating and developing sales policies, procedures and programs for the world-wide Calspray organization. Wierenga attended Colorado A&M and South Dakota A&M, where he received a B.S. degree in Agriculture. He joined Calspray 13 years ago as a sales representative in central California, and was soon promoted to branch manager. He was then promoted to district manager and transferred to the Middle West, later serving as manager for the Great Lakes area. In 1955 he returned to the home office in Richmond, Calif., where he assumed managership of the then newly-created Foreign Department. He was elected a vice president and manager of the Marketing Department in May, 1959.

STUART H. BEAR, division manager of Niagara Chemical Division, Food Machinery and Chemical Corporation, was graduated from Pennsylvania State University with a BS in Horticulture. He also is a graduate of the Executive Program in Business Administration of Columbia University (Arden House). He joined the Niagara sales organization in 1931 and served in various capacities with the division until his promotion to his present position in 1958.

CREDIT TRAINING FOR DEALERS

SETTING UP A "SHORT COURSE". *There are several sources to aid you. First learn the problems from the dealers' point of view, then find the program best suited to meet the need.*

By F. E. HARTZLER

Thus far in this series we have talked about credit. We have shown first of all a credit budget usually called a cash flow chart—through which a dealer can budget his capital requirement just as he does his sales. Then we discussed the need for credit. Such a discussion, I think, is essential in modern business—credit and the need for credit must be understood. In the third article, we dealt with common credit practices and instruments. Each of the three have pointed to one all important question: all of which you have a right to say was fine, but what can I do now.

HOW CAN YOU, the manufacturer, help your dealers establish a good credit program? Let's borrow a page from the politician's handbook. Taking first things first, you must get down to the grass roots and feel out the situation there. A trip through your territory talking to your dealers should accomplish exactly that. In this case you should ask them what their problems are in handling credit.

You can bet your bottom dollar and a dime with it, that it will not be the problems that we have discussed in this series. They will want to know such things as:

1) How can I tell a good risk?
2) When is my credit getting dangerous?
3) How do I turn down a customer?
4) How can I use credit as a selling tool?
5) How can I collect an overdue bill?

These are essentially retail credit problems. With this question you might ask a couple more:

1) Would you come to a short course on credit?
2) What month would you rather have it?
3) How long can you be away?

CONTACT YOUR ASSOCIATION

Armed with this information your next move should be to contact your association representative. If he agrees that the problem is a serious one and a few telephone calls assure him that other companies have these same problems, then you can feel satisfied that you have the real problems safely in hand. Remember, of course, that none of the things listed may be a problem in your area; you may find something entirely different. Whatever it is, the problem to tackle is the one that comes from your dealers.

Your association representative has certain rights and privileges that you do not have. You cannot ask for a course under public education for your own people. But if the industry feels that this is a common problem then the industry representative has just as much right to ask for help as does any other group of tax-payers.

So with your problem in his hand the industry

Stainless Steel farm chemical tanks outlast others 10-to-1

Consider some of the advantages of a Stainless Steel sprayer tank: Twenty to thirty years of service* . . . no trouble with plugged nozzles or booms . . . almost no maintenance . . . switch from fertilizers to herbicides safely with only a proper water rinse between jobs . . . the saving of time that comes with a dependable rig. Of course the initial price of this tank is higher. You pay more in the beginning for a Stainless Steel tank, but it outlasts others ten-to-one. This higher initial cost becomes a bargain over the years. And it is the cost-per-year on equipment that is important!

Liquid chemicals are widely used on well managed farms. This practice is fast, sure, and saves labor. Taking advantage of this practice demands a tank that will be a steady performer. Stainless Steel's tough, smooth finish resists the corrosive attack of all farm chemicals. For example, tanks, lines, valves, booms and nozzles made of Stainless Steel resist the corrosive attack of complete liquid fertilizers. Freedom from corrosion and resulting residues assures uniform application rates and trouble-free service.

Talk to your equipment supplier about getting a Stainless Steel farm chemical tank. He'll probably recommend that your tank be made of Type 304 Stainless Steel. You'll find your Stainless Steel farm chemical tank is a sound investment that will pay off for years to come.

USS is a registered trademark

**Based on a corrosion rate of less than 0.02 mils per year observed during a 31-month test period.*

Stainless Steel

This mark tells you a product is made of modern, dependable Steel.

USS

United States Steel Corporation—Pittsburgh
American Steel & Wire—Cleveland
National Tube—Pittsburgh
Columbia-Geneva Steel—San Francisco
Tennessee Coal & Iron—Fairfield, Alabama
United States Steel Supply—Steel Service Centers
United States Steel Export Company

United States Steel

CREDIT TRAINING FOR DEALERS (Continued)

representative can go hunting for help. He may, if he chooses, approach the state university and ask them to help set up a program in credit based on these problems.

Or he may go to the state supervisor of distributive education or business education with his problem and ask for help.

There are advantages to using the university facilities if you desire a single meeting. They are used to such meetings and can probably handle them with a minimum of fuss. You can use the university staff to handle instruction and the university facilities for housing and feeding.

The state board for vocational education, on the other hand, usually has a little more leeway and can act in ways that some universities simply cannot.

For example, you may want to have five or six regional meetings over the state with groups of not more than twenty. This most state boards can do easily. Although the state boards usually do not use university staffs, they can help by training a successful dealer in how to teach, or by bringing in an outsider for such a series of meetings off the campus.

DEVELOPING A CREDIT MANUAL

Or you may want to do what some other associations have done. You may decide, through your association, that you would like to develop a credit manual for fertilizer or agricultural businesses. For such a project as this your representative could call on the U. S. Office of Education and the Distributive Education Division asking them for help in developing a manual. A number of associations have done this; combining the material provided by the industry and the teaching techniques devised by the U. S. Office has developed some fine manuals.

With such a manual you are then prepared to go to each state supervisor to ask for his help in getting credit classes set up in your state.

Regardless of the avenue chosen for setting up classes to train your dealers, there are a few standards to keep in mind to insure good results. Above all, remember the class should be limited to a maximum of twenty-four members. Second, because you will want each person when he leaves the class to be able to do certain things, you should have your objectives clearly in mind at the beginning.

UTILIZE THE "PRACTICE" METHOD

Now to the method of instruction: With small classes and clear objectives you can utilize the practice method effectively. For instance, if your problem is how to turn down a poor credit risk, methods can be taught this way. Have a man serve as the customer, one as the store manager, and assign two as listeners. Then actually go through the process, having each person say the words and act out the role. The two listeners can then serve as critics. After each practice the men should be shifted until they have filled each role. This brings in the thinking of four men and they learn by doing.

This sort of small group pattern operated correctly is fine. It is not a workshop; it is, instead, a practice session. For many of your personnel it may be the first time they ever had a chance to practice, a chance to hear themselves and a chance to have the customer tell them what he thought of their performance.

There is yet another tremendous advantage of such small groups. For convenience of explanation, let us say that the area under discussion is that of taking a credit application. The demonstration is over. The dealer knows that he should take an application, but he doubts that he can do it. Now he gets his chance to practice. If he once trys it, even if he is no Cary Grant, he will feel that he has a chance to perfect his technique and we have found that the odds are five to one or better he will try it when he gets home. If he has a chance to practice three or four times, until it becomes just a little bit boring, you have probably changed his behavior, because he will be rather eager to try it. He has a man in mind he wants to try it on.

WHY NOT DO THE TRAINING MYSELF?

You may be asking by now, "Why should I go to all the trouble of getting help from a state agency? Why don't I just do this training myself?" Frankly, this depends entirely upon your relations with your dealers. However, from the experience of something like fifteen years of adult management education, I would say that you will get more support from your dealers if you use one of the established agencies such as your university or the state board.

There are three reasons for this. First of all, even if all the outsider does is to tell your dealers the same thing you have been telling them for the last twenty years, an outsider's saying it will carry more weight and conviction. It helps. Second, these people frequently know more about education than you do. It is their business. And there is one more reason: if *you* are presenting the school for credit, your dealers may see it as a chance to push questions such as the price next year, "Why didn't you send me more stuff? Somebody down the road is selling it cheaper." Regardless of how you handle such a situation it will weaken the effectiveness of your school. Another big reason for having an outside agency at least help with the training is that you can build a little industry good will.

Using these agencies you can also be assured that the best judgment of many men is put into the program and what you end up teaching will be a good solid business practice. When your dealer sitting next to another dealer learns they both must operate on sound business principles—it does an industry no harm.

Briefly, to train dealers in the use of credit you must first learn what their problems are from their point of view, then find the program best suited to meet the need. ▲

WHICH BAG COST 20% LESS TO PRODUCE?

Formula, purity, weight, packaging—*all* identical. Yet, one bag cost 20% *less* to produce than the other.

Why? Because one manufacturer called on Texaco's Technical Service for advice on improved fertilizer manufacturing techniques.

Do you have an agronomic or fertilizer manufacturing problem? Do you want more efficient, more economical production? Why not tell us about it.

Our Technical Service people have a wealth of experience in agronomy and fertilizer manufacturing —both in research and practice. They'll be glad to share it with you.

Texaco Inc., *Petrochemical Sales Division,* 332 South Michigan Avenue, Chicago 4, Ill., or 135 East 42nd Street, New York 17, N. Y.

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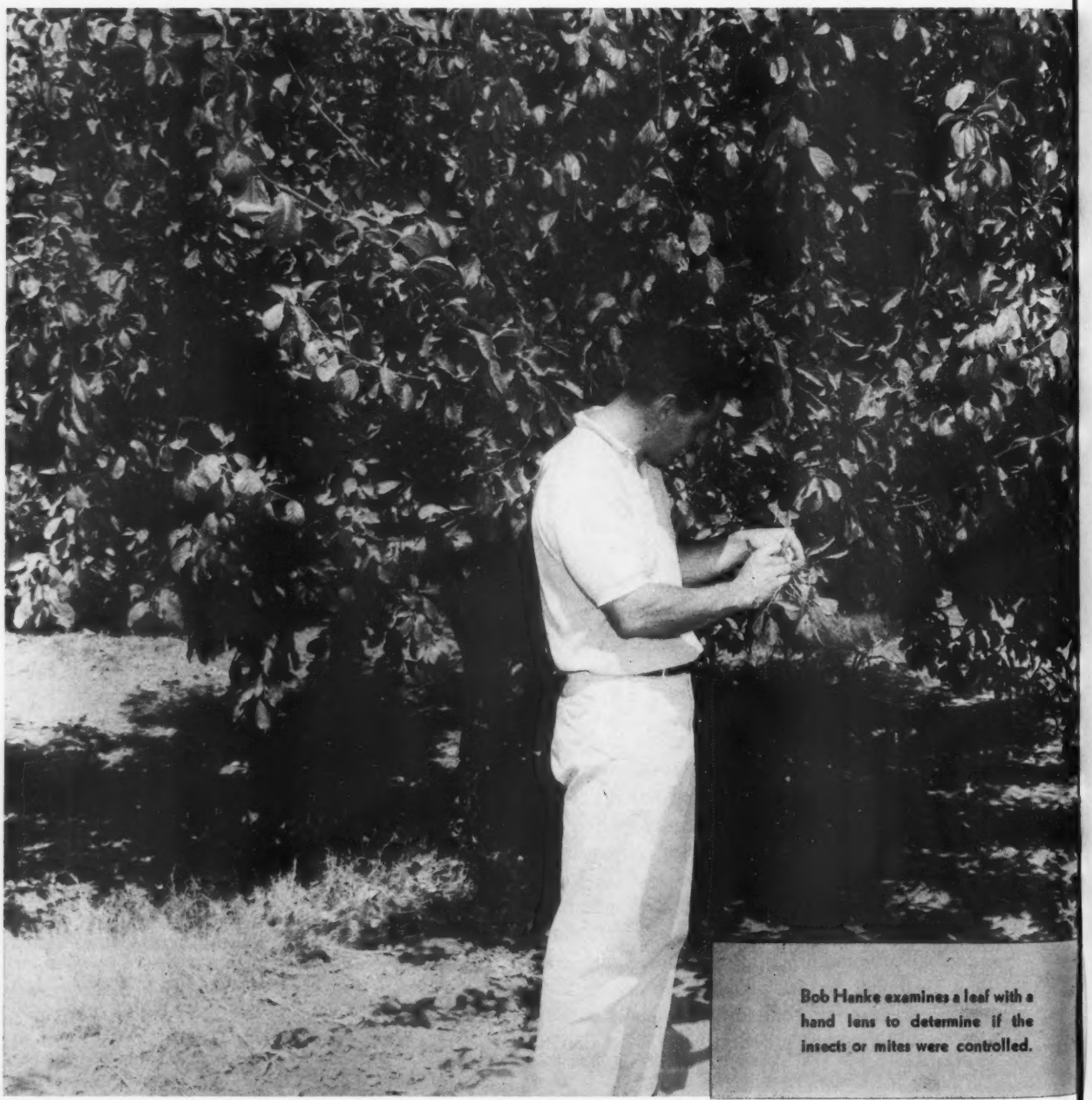
MERCHANDISING AIDS

PROMOTION

Bob Hanke Chemicals is a co-pioneer in something new in pest control. Bob's farmers tried Thuricide this past season and liked it. Now the product is in inventory, formulated, packed and ready for the market next spring.



Bob Hanke examines a leaf with a hand lens to determine if the insects or mites were controlled.

THURICIDE

NEW DIMENSION IN PEST CONTROL

THIS summer, tomato growers near Yuba City, California, had a problem. Their fields bordered almond and peach orchards. To spray tomatoes against hornworms, army worms, and cabbage loopers with certain insecticides might cause a spray drift residue problem on the almonds and peaches.

Bob Hanke (rhymes with "lanky") helped solve the problem—and in doing so co-pioneered a new concept in insect control. His answer: Thuricide®, which is an insecticide containing spores of *Bacillus thuringiensis* Berliner.

Bob runs Bob Hanke Chemicals at Yuba City, a company supplying the rich Central Valley with fruit and vegetable-growing supplies. Besides pesticides, Hanke Chemicals handles anhydrous ammonia, nitrogen solutions, and complete liquid and solid fertilizers.

Thuricide is safe. So safe, in fact, that it's even the answer to the prayers of excitable conservationists, organic cultists, and sundry alarmists loudly heard from these days.

Reason for its safety is that it's a disease organism specific to certain foliage-eating insect larvae. It's so danger-free that the FDA has granted the material that most enviable phrase, "exempt from the requirement of a tolerance."

(Discussion up to this point has been about Thuricide. That's the registered trade name of *Bacillus thuringiensis* Berliner as developed and produced by The Bioferm Corporation, Wasco, Calif., and marketed by Stauffer Chemical Company. However, at least two other companies are also in this particular biological control business. Next spring, Rohm and Haas will market Bakthane L69, produced in Rohm & Haas' Philadelphia laboratories. Neutralite, a California firm, reportedly is or will be selling through grocery and other retail outlets a similar product for homeowners. Several other companies—Merck, for example—have considered adding *Bacillus thuringiensis* to their lines.)

In demonstrations and controlled tests, Stauffer has tried Thuricide in many states—Florida and California predominately—under varied conditions and for some 25 vegetable, fruit, and field crops. In addition tests recently reported indicate that Thuricide gave excellent control of gypsy moth caterpillars following aerial applications to deciduous forest trees in Vermont. Tests were also made this past summer on spruce budworm and black headed budworms on hemlock.

Thuricide's available as wettable powder or dust. (Tomato growers near Yuba City aerially applied a dust containing 50% sulfur in addition to the Thuricide.) Stauffer Thuricide Wettable Powder contains an incredible 30 billion viable spores of *Bacillus thuringiensis* per gram. Recommended dosage runs between one-half and four pounds per acre in sufficient water for good coverage. Thuricide Dust on the other hand, contains 3 billion spores per gram with a dosage of ten to 35 pounds per acre.

Stauffer Chemical Company plans "to promote sales for (the vegetable) market aggressively next season . . . In both Florida, and California we have our material now in inventory, formulated, packaged, priced, and ready for the market there when it is time."

Rohm and Haas' Dr. E. M. Swisher indicates that Bakthane L69 also will be available in quantity by

They all picked

All these famous firms have one thing in common: They operate Union I & C Baggers. And their number is increasing each year. Two I & C users now operate 68 machines. Another recently converted twelve of its plants to I & C Baggers. Hundreds of units have been installed throughout industry—in the last four years alone!

This trend to Union's I & C Bagger began almost as soon as the unit was introduced. The first completely automatic pre-weighing machine for open mouth bags, Union's I & C Bagger made possible great savings for the farm, food and chemical product industries—savings in increased production and reduced labor, and savings through the use of a lower cost bag. And the I & C was the first machine designed specifically for ease of installation—featuring lower head room and requiring floor space of only 5′ x 5′.

Regardless of the size of their operation, manufacturers and processors immediately found that Union's I & C Bagger was a practical, profitable investment. The trend began . . . and still continues. Though much imitated, Union's I & C Bagger is still specified time after time by leading packers of free-flowing materials.

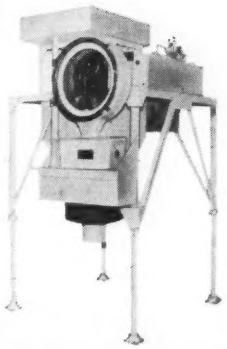
Like these firms, you'll find that the savings achieved with Union's I & C Bagger will pay

Union's I&C Bagger!

for its cost in a remarkably short time.

Service within hours

Every I & C Bagger installation is backed up by Union's staff of field service experts—geographically located to give you the fastest possible service. There's always a Union representative available for consultation on bagging methods and equipment. *Write for illustrated booklet describing the complete line of I & C Baggers and auxiliary equipment.*



UNION's I&C BAGGER

Automatic weighing and filling machine for open mouth bags. Manufactured by Inglett & Company, Inc., Augusta, Georgia.

UNION-CAMP®

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THURICIDE *(Continued)*

next spring. Dr. Swisher adds, "We plan to market our material as a supplement to chemical insecticides where residues are a problem." Without question, Rohm and Haas and Stauffer are and will be the unchallenged leaders in *Bacillus thuringiensis* sales. Both will sell under their own names.

Actually, it is the Bioferm Corporation which is producing material for Stauffer to market. (Rohm and Haas will produce and sell its own material.) Because of the microbial insecticide, Bioferm operates what is probably the world's first industrial insect pathology laboratory. Bioferm registered the name "Thuricide," and in 1958 the company applied to FDA for temporary exemption from tolerance. A full exemption from tolerance for certain crops was granted on April 14 of this year. Stauffer, in cooperation with Bioferm has conducted most of the field demonstration work.

DOES IT WORK?

Does the microbial insecticide work? Apparently very well.

James B. Bowers, of Stauffer's Sales Development Dept. in Calif., who has followed the material as closely as anyone in the company, reports that control of hornworms and army worms by Thuricide "is equal to DDT and DDD control and better than those materials on the cabbage looper."

Bob Hanke goes a step further: "In this area, we've never been able to get good control of the cabbage looper with DDT. Thuricide gives us the control we're looking for." Bob also says that even with an exceptionally high insect population in the Central Valley this year, Thuricide has been giving good control.

Bob's customers applied 40 pounds of Thuricide dust per acre this year at 25-day intervals, far longer intervals than would have been necessary with chlorinated hydrocarbon applications. The longer interval will, of course, tend to lessen the gap between costs of DDT and the microbial material.

Bob's his own entomologist. A University of California graduate ('52) in agronomy, he's learned most of what he knows about bugs from living with them in the field. He anticipates a good year in Thuricide next year.

COMPATIBLE WITH MOST INSECTICIDES

According to Bioferm, Thuricide is compatible with commonly used insecticides (except TEPP) and fungicides (except Spergon). Insect activity is retained in mixture with water, soybean oil, mineral oil, and diesel fuel. Diluents that may be used with Thuricide include talc, pyrophillite, clays, carbonates, diatomaceous earth, and commonly used surfactants and stickers. The dry microbial powder is stable indefinitely if stored below 120° F.

There have been no reports of toxicity by Thuricide to insect predators or beneficial insects . . . or, for that matter, to any plants, warm blooded animals, or wildlife. On the other hand there have been many reports of lower aphid and spider mite populations. This may indicate either predator control of these pests or some direct but undetermined effect of Thuricide itself.

Manufacture of the bacterial spores is similar in process to the production of antibiotics. Spores are grown in pure culture in large fermentation tanks. Pharmaceutical controls are applied throughout fermentation, filtration, and drying. A mouse safety test is applied to each batch to make sure harmful microbial strains are not developed during production.

SPORES MUST BE INGESTED

Since Thuricide is a live insecticide and a specific insect pathogen, viable spores must be ingested by the pest. A Stauffer technical bulletin academically states, "A concentration of insecticide must be applied so that the minimum ingestion rate is 450 viable spores per milligram insect body weight." With three billion spores per gram, it is assumed that insects will ingest the required minimum when five to 30 pounds of dust are applied per acre.

Commercial production and sale of *Bacillus thuringiensis* is reminiscent of the development of *Bacillus popilliae*, or milky disease of Japanese beetles. In fact, the two bacilli are the only commercially available bacterial control agents on today's market.

As with *Bacillus thuringiensis*, ingested *Bacillus popilliae* spores infect the worm or grub stage of the insect. By contrast, *Bacillus popilliae* spores are long-lived in the soil, remaining alive for several years and resisting excessive dryness or moisture, cold, and heat. Milky disease spores have been marketed since 1940 under the trade names "Doom" and "Japidemic."

USDA's Technical Bulletin 1139, "Biological Control of Insect Pests," reports that the microbe *Borrelina campeoles* has proven effective against the alfalfa caterpillar. *Bacillus thuringiensis*, *Bacillus popilliae*, and *Borrelina campeoles* are the only three microbials "sufficiently successful . . . that their use may be considered practical for control in the field," according to USDA.

(*Borrelina campeoles* has never been made commerically available.)

Dr. C. H. Hoffman, "dean of biological insect control," indicated in August that control of European corn borer, Great Basin tent caterpillar, cabbage looper, several sawfly species, and codling moth by insect pathogens is promising. How far along these controls have been developed is not known.

One thing is certain. Successes exhibited in the field by *Bacillus thuringiensis* Berliner backed up by home and garden successes with *Bacillus popilliae* over the past 20 years have created a new and encouraging climate for this type of insect control. An immediate limitation to development of additional controls is the lack of personnel to carry out the most basic and applied research.

A satisfactory start has been made. ▲

Farmer PURCHASING PATTERNS for PESTICIDES

New study includes weed killers, grass killers, soil insecticides, crop insecticides, brush killers and grain fumigants

By GEORGE M. BEAL
JOE M. BOHLEN and
DARYL J. HOBBS*

MANY individuals and groups have a stake in the optimum use of pesticides by farmers. The farmer, educational institutions and agencies, and the chemical manufacturers, formulators, distributors and dealers and salesmen all have potential benefits in increased use of pesticides.

The fact that pesticides are an important and profitable input in the farmers' operations is well established. However, there is general consensus that pesticides are not being used at near the optimum level by most farmers.

Securing optimum pesticide use is a complex problem. One important aspect of the problem may be the distribution system for chemicals and as a part of this aspect the role the pesticide dealer plays. A dealer is defined in this article as that entity from whom the farmer buys his chemicals. There seems to be a lack of basic quantified data on just where the farmer buys his pesticides, his purchase patterns, and why he buys his chemicals where he does. It is recognized that the answers to these questions will vary from state to state and from region to region. A recent statewide farmer study in Iowa provides some specific data on farmer purchase patterns. The generalizations from this study may apply to other similar types of farming areas with similar distribution patterns. The data may provide insights for other types of farming areas and areas that have different distribution systems.

*Rural Sociologists, Iowa State University. *Data in this paper are from Iowa State University Agricultural and Home Economics Experiment Station Project No. 1320 done in cooperation with the Dow Chemical Company. The project is under the co-leadership of George M. Beal and Joe M. Bohlen, Professors of Rural Sociology, Department of Economics and Sociology, Iowa State University. The phase of the project reported here is under the supervision of Graduate Assistant Daryl J. Hobbs.*

THE DATA BASE

Data from which this report is written are taken from one phase of Iowa State University Agricultural Experiment Station Project No. 1320, a cooperative project with the Dow Chemical Company. The data were collected by personal interview with a random sample of 315 Iowa farmers, who were farming more than 40 acres. The interviews were taken in the summer of 1958. Data were collected on pesticide use for the years 1955, 1956, 1957 and part of 1958. Data were collected on six categories of pesticides: weed killers, grass killers, soil insecticides, crop insecticides, brush killers and grain fumigants.

PURCHASE PATTERNS

What is purchased?

As background it may be of value to examine briefly the extent of pesticide use. Ninety-two per cent of the farmers were using some pesticides in the above six categories of chemicals at the time of the study. Eight per cent used no pesticides. Twenty-three per cent used pesticides *exclusively* on yards, ditches, fence rows and roadsides. The remaining 69 per cent used some pesticides on field crops. At the time of the study weed killers were used by 87 per cent of the farmers in the sample, soil insecticides by 30 per cent, crop insecticides by 14 per cent, brush killers by 19 per cent and grass killers and grain fumigants each by 4 per cent.

Pesticide expenditures

The average expenditure for *all* farmers for 1957 was $47.02. The average expenditure for the 92 per cent using some chemicals was $53.47. Thus when average pesticide purchases of farmers are analyzed it is obvious that they represent a relatively small outlay of capital when compared with other major farm inputs.

Where pesticides are purchased

Ninety-two per cent, 290 farmers in the sample, were purchasing at least one pesticide of the six categories of pesticides under study. These 290 farmers mentioned 417 places of purchase for their pesticides. The places of purchase were categorized by the general term that would best describe the places of business. As can be seen in Table 1, there were a large number of different types of business from which farmers purchased pesticides.

Column 1 in Table 1 presents the per cent that each category of place of purchase is of the total places of purchase. Grain elevators represented the largest category of places of purchase: 32 per cent. Seventy-five per cent of the elevator places of purchase were cooperative elevators. In fact, cooperative elevators represented the largest category of places of purchase: 24 per cent of total mentioned places of purchase.

TABLE 1. PLACES OF PURCHASE FOR PESTICIDES

Place of Purchase	Column 1 Total Percent of Places of Purchase (n = 417)		Column 2 Percent of Total Agricultural Chemical Business Done	
1. Elevators		32		40
Cooperative elevators	24		30	
Private, partnership or corporation elevators	8		10	
2. Feed and seed stores		15		17
3. Farm service companies—Farm Bureau		14		15
4. Implement dealers		7		4
5. Petroleum dealers		6		5
6. Seed corn dealers and companies		5		4
7. Farmer dealers		5		4
8. Drug stores		3		1
9. Hardware stores		2		1
10. General farm supply stores		2		1
11. Produce stations		2		1
12. Commercial sprayers		2		2
13. Country general stores		1		.5
14. Other and don't know		5		4.5
		100		100

Feed and seed stores represented 15 per cent of the places of purchase and Farm Bureau Service Companies represented 14 per cent. Major product lines of Farm Bureau Service Companies in Iowa in most cases are petroleum products and fertilizers. The additional categories of places of purchase listed made up seven per cent or less each of total places of purchase.

Per cent of business done by each category

Column 2 in Table 1 presents the per cent of the total pesticide business done by each of the place of purchase categories. These percentages were computed from data given by farmers. They were not computed from pesticide sales data given by dealers.

In general the per cent of pesticide business done corresponds rather closely with the per cent of places of purchase in each category. There are two major exceptions: (1) while elevators made up 32 per cent of the places of purchase they accounted for 40 per cent of the pesticide business, and (2) while implement dealers made up seven per cent of the places of purchase they accounted for only four per cent of the chemical business.

Number of dealers from whom purchases are made

Sixty-five per cent of those purchasing pesticides purchased from one dealer. Twenty-seven per cent purchased from two dealers and eight per cent purchased from three dealers.

Reasons for purchasing from more than one dealer

The 35 per cent who purchased from more than one dealer were asked why they purchased at more than one place. The answers are presented in Table 2.

Table 2. Reasons Given for Purchasing Pesticides From More Than One Dealer

REASONS	PER CENT (n = 103)
'Just buy where most convenient'	40
'Do regular business with more than one dealer'	25
'Regular dealer didn't have chemical I wanted'	12
'No special reason', don't know	23

For those who buy from more than one dealer, "convenience" and "regular place of purchase of other needed farm supplies" appear to be the major considerations in determining where pesticides are purchased. For the answers given by the 12 per cent who stated their regular dealer did not have the chemical they wanted there are at least two possible interpretations: (1) the dealer did not have the specific brand of chemical desired, or (2) the dealer did not handle, or have on hand, the particular functional chemical or chemical formulation desired. The fact that 23 per cent stated there was "no special reason" or they "didn't know" might be interpreted to mean that this group did not perceive much difference between dealers.

Dealer or brand loyalty

Additional data indicate that the purchasers of pesticides are much more loyal to their dealers than they are to any particular brand. All of the users of pesticides were asked the question, "If your agricultural chemical dealer changed the brand he is now selling to another well known brand, would you change dealers so you could continue to obtain the brand you are now using, or, stay with the dealer and purchase the new brand he carried?" The responses to this question are given in Table 3.

Table 3. Change Dealers or Change Brands

	PER CENT (n = 290)
Change dealer to obtain specific brand	14
Stay with dealer and change brands	78
Don't know answers	8

Over three-fourths would stay with their present dealers. This would seem to indicate there has not been a very high brand or product image preference built up in the minds of the purchasers of pesticides. It would also seem to indicate that for the majority of the farmers the dealer is playing a very important role in the farmer's brand selection—the farmer purchases what is convenient and what his dealer carries. Additional data indicate that the dealer is the main influence on brand selection in 61 per cent of the cases. Quality of product, past results obtained from product use and results obtained by neighbors and friends were the next most frequently mentioned influences.

Distance from dealer

Additional evidence that convenience and traditional purchasing patterns are two important considerations in determining where pesticides are purchased is provided by the data.

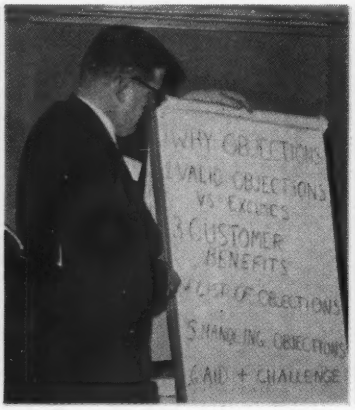
The average distance to the dealer from whom the farmer purchased his chemicals is approximately 6.5

(Continued on page 36)

Sales builders

At training sessions like these, IMC probed selling problems with over 500 fertilizer industry executives.

The latest visual presentation techniques were used to gain maximum impact. Meetings like these helped members of the fertilizer industry realize their full profit potential.



Selling approaches were carefully analyzed . . . from "why people buy" to "getting them to sign on the dotted line." This program has generated impressive sales results in many areas.

Markets were analyzed for sales potential. Participating executives saw demonstrations of practical selling ideas that help keep costs in line, manufacturing forecasts realistic and product specifications suited to area needs.

IN ACTION!

Last year, IMC briefed over 500 fertilizer industry executives on broadening markets . . . meeting objectives . . . closing sales

This fall, IMC Customer Training Meetings will feature technical seminars on better methods . . . more efficient production . . . ways to cut production costs

The IMC Customer Meetings will present technical information in the same interesting and informative manner used in the popular sales training meetings last year. Response to those meetings was immediate and enthusiastic. In 10 cities throughout the country, these two-day sessions were warmly received. Leading fertilizer executives made comments like this:

"This could revolutionize the fertilizer industry in marketing and merchandising. I'm sure glad I attended."

"Our time was well spent. This was the best meeting I can remember attending. It covered fundamentals, not flashy promotion."

"Our group was amazed by the number of good ideas and principles presented. Coverage was excellent."

"This type of meeting should be expanded."

Technical training offered to IMC customers

Now, because of repeated requests from IMC customers, including many who attended Sales Training Meetings, IMC has condensed solutions to the most troublesome technical problems confronting fertilizer manufacturers. Formulation, mechanization, maintenance and trouble-shooting are all part of this practical meeting agenda. Day-to-day problems will be discussed in 11 cities throughout the country.

Plan to attend the IMC Technical Training Meetings — one of which will be close to your city. Check below for time and places.

CITY	DATE
Minneapolis, Minn.	Monday, Tuesday, October 24, 25
Indianapolis, Ind.	Wednesday, Thursday, October 26, 27
Baltimore, Md.	Wednesday, Thursday, November 9, 10
New York, N.Y.	Monday, Tuesday, November 14, 15
Raleigh, N.C.	Wednesday, Thursday, November 16, 17
Toledo, O.	Monday, Tuesday, November 21, 22
Winter Park, Fla.	Monday, Tuesday, November 28, 29
Montgomery, Ala.	Wednesday, Thursday, November 30, December 1
Kansas City, Kan.	Monday, Tuesday, December 5, 6
Tyler, Tex.	Monday, Tuesday, December 12, 13
Jackson, Miss.	Wednesday, Thursday, December 14, 15

AGRICULTURAL CHEMICALS DIVISION

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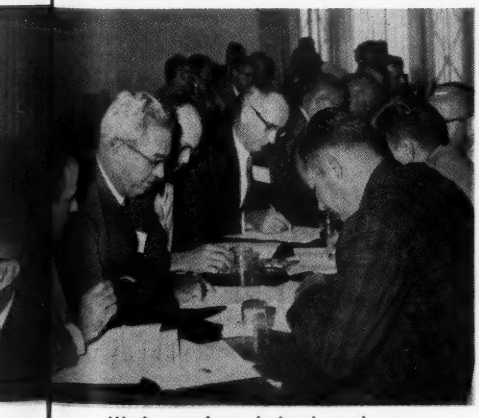
PRODUCTS FOR GROWTH*

*TRADEMARK



Work sessions helped each executive measure his own progress. These meetings . . . held in 10 cities . . . were well attended and highly praised for their practical and informative content.

Sales problems of individual participants were discussed in detail. These sessions dealt with practical day-to-day matters important to every executive in the industry.

These sessions . . . forerunners of the 1960 technical seminars . . . were part of IMC's continuing program of help to the fertilizer industry.

FO-2-01

PURCHASING PATTERNS *(Continued)*

miles. Over 73 per cent of the farmers purchased their chemicals within ten miles of their farms.

Length of time dealer has been patronized

On the average the purchasers of pesticides have patronized the dealer(s) from whom they are presently purchasing their chemicals for more than ten years.

Dealer "on the farm calls"

Apparently the dealer(s) from whom the farmer is buying his pesticides is not pushing pesticide sales to any great extent by direct "on the farm" sales. According to the data gathered from the farmers only 14 per cent of the dealers or their salesmen from whom the farmers purchase their chemicals make "on the farm" calls to sell them pesticides. Fourteen per cent stated that dealers or salesman other than the one(s) from whom they bought their pesticides called on them. The possibility of a farmer being called on by both the dealer from whom he buys and other dealers as well is obvious. Thus the data indicate that less than one-fourth of the farmers were contacted directly on the farm in relation to pesticide sales. The respondents also indicated in most cases that those dealers and salesman who did make on the farm contacts were also selling other larger volume product lines in addition to chemicals.

SUMMARY AND IMPLICATIONS

In summary the following conclusions seem warranted. Pesticides represent a relatively small input in the average farmer's operation. Farmers buy their pesticides where it is convenient and/or where they market or purchase other farm products and supplies. They do not travel great distances to purchase their pesticides and buy from dealers with whom they have dealt for a relatively long period of time. They are far more loyal to their present dealer(s) than they are to any specific product or brand. The majority of dealers do not actively seek increased pesticide sales "on the farm."

The data presented in this article do not completely answer the complex problem of why farmers do not use more nearly optimum amounts of pesticides. Nor, do they answer fully the questions revolving around purchase patterns and the role of the dealer. However, it is hoped they do provide some sound quantified data regarding purchase patterns of farmers and the present role played by dealers.

Additional data will be supplied when: (1) more detailed analyses are made of the data from the statewide random sample of 315 farmers, (2) when the data are analyzed from a limited interview with a 10 per cent sample of Iowa agricultural chemical dealers, and (3) when intensive interviews and analyses of data are completed from a purposive sub-sample of pesticide dealers. All of this research is now under way at the Iowa State University Agricultural and Home Economics Experiment Station.

However, in the meantime, those directly concerned with the problems under discussion in this article can make their own additional interpretations of these data and make applications to their own particular situations. ▲

The Big Moo...

In 1959 there were some 19,300,000 milk cows on farms, producing 6,400 lbs. of milk per cow, with a total annual production of 124,396 million pounds. Farmers got cash receipts from milk and cream exceeding $4.6 billion. Significantly, 43% of all milk cows in the U.S. on January 1, 1960 were on SUCCESSFUL FARMING *farms! SF is edited for high producing farmers who produce 10-12 thousand pounds of milk per cow.*

The statistical average cow in a year eats from five to six tons of hay, corn, grain, and feed supplements. To build the soil for crop nutrition, SUCCESSFUL FARMING subscribers purchase vast amounts of commercial fertilizer.

SF farms are big, and getting bigger, They average more than 300 acres, 50% larger than in 1945.

And SUCCESSFUL FARMING families are in the better income brackets. For the past decade SF farmers' annual cash income has been about 70% higher than the annual U.S. farm average.

With better incomes and with better brains, they utilize the best methods and techniques, maintain soil fertility, use fertilizer and all types of farm chemicals to achieve higher production and yields.

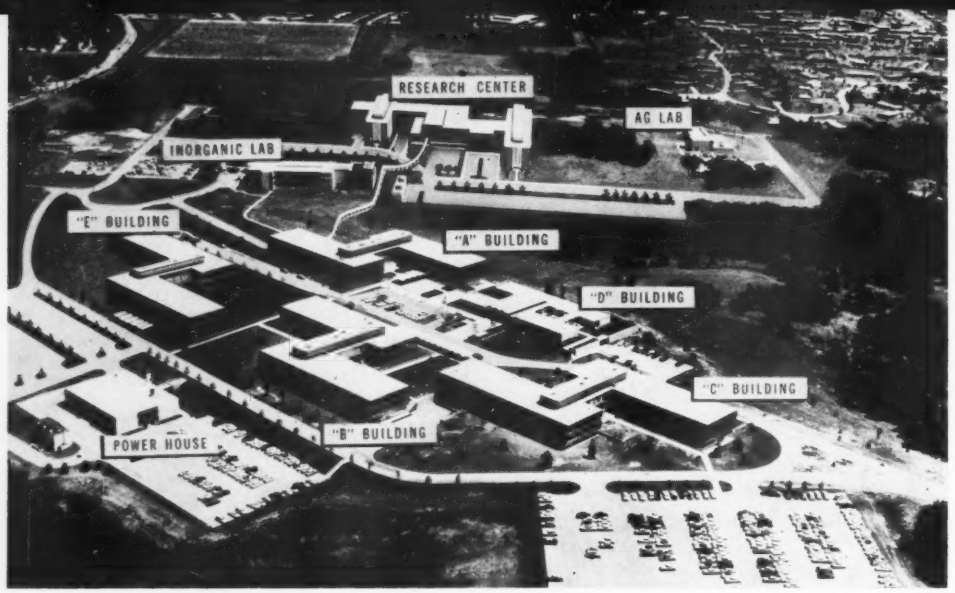
Farm chemical advertisers in SF get valuable dealer support. Dealers know its influence and prestige in their area.

SUCCESSFUL FARMING gives 1,300,000 circulation heavily concentrated among best US farmers in the National Edition.

With State and Regional Editions, SF puts extra sales push in specific areas, does selective and seasonal selling.

All the SUCCESSFUL FARMING editions enjoy the same editorial excellence, fine quality reproduction, long life. For more farm chemicals sales, SUCCESSFUL FARMING should be your medium!

MEREDITH PUBLISHING COMPANY, Des Moines... *with offices in* New York, Chicago, Atlanta, Boston, Cleveland, Detroit, Los Angeles, Minneapolis, Philadelphia, St. Louis, and San Francisco.



Aerial view of Monsanto's general offices and laboratories in St. Louis county.

Tom K. Smith has been named general manager of the new division and a vice president of Monsanto Chemical.

Monsanto organizes an Agricultural Chemicals Division,

Planned for Efficiency

CHEMICALS are indispensable tools of today's agriculture. They will become increasingly important as an expanding population demands quality food in abundance and at a low price from the dwindling farm labor force."

"This is a major research challenge and marketing opportunity to companies such as Monsanto. Our new Agricultural Chemicals Division will concentrate vigorous effort on them and, at the same time, will make for an optimum economy and efficiency in these efforts," said Tom K. Smith Jr. of St. Louis, who has recently been elected a vice president of Monsanto and appointed general manager of the new operating division.

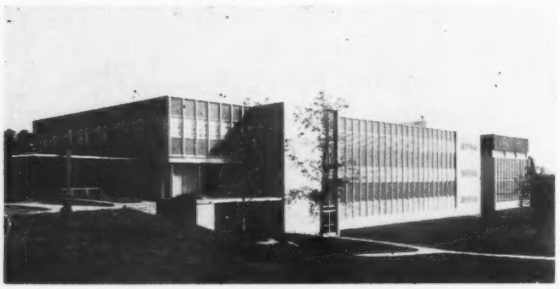
Smith said the formation of the new division brings about a consolidation and strengthening of research, development, manufacturing and marketing efforts on agricultural chemicals formerly shared between two Monsanto divisions as part of their broad, multi-industry interests. This greater concentration will enable Monsanto to "zero in" on the customer problems.

The divisions' salesmen will now sell a complete product line to include fertilizer, pesticides and feed additives. All in all, Monsanto customers will realize better service. Monsanto is also the world's largest manufacturer of elemental phosphorus and one of the major producers of nitrogen products.

Smith also pointed out that agriculture was Monsanto's second largest industry customer in dollar volume last year, accounting for 11.46 per cent of the company's total sales to consuming industries.

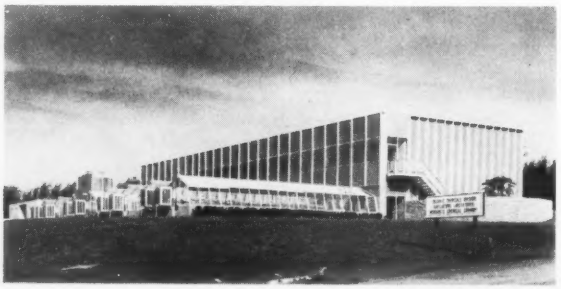
Headquarters and research laboratories for the new division will be located at St. Louis. Its production facilities will include plants at El Dorado, Ark., and Luling, La., with additional manufacturing units at the company's Anniston, Ala., Nitro, W. Va., and Monsanto, Ill., locations.

Organization of the new Agricultural Chemicals Division involves the following new appointments. J. P. Ekberg, director of marketing; Dr. R. S. Gordon, director of research; S. B. Johnson, director of engineering; R. R. Rumer, director of manufacturing; J. H. Senger, director of development; and F. T. Mitchell, director of administrative services.



The Inorganic laboratory, shown above, houses facilities to emulate plant operations. This enables the division to assist customers in solving their technical problems.

At right is the Organic Chemicals Agricultural Laboratory



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In a WONDERWALL bag, fewer or lighter plies are needed compared to a natural kraft multiwall. Equally important, WONDERWALL withstands far more impact without breaking than conventional natural kraft multiwalls. Secret of WONDERWALL savings is in the "built-in" stretch of Clupak* extensible paper.

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West Virginia Pulp and Paper

*Clupak, Inc.'s trademark for extensible paper manufactured under its authority and satisfying its specifications.

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Gentlemen: Please send me more details on WONDERWALL bags. I now pack _____ (product)

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COMPANY _____

STREET _____

CITY _____ ZONE ____ STATE _____

New Chemicals and Treatments

were discussed at the recent American Phytopathological Society meeting

TWO NEW, effective chemical weapons against plant diseases were unveiled by Hercules Powder Company. Although still experimental, the two materials show particular promise as protective seed treatments for cotton, peanuts, and corn and other vegetables, and as soil treatments for cotton. They also may have disease control value when applied as sprays to plant foliage. The chemicals, currently designated by the experimental numbers 3944 and 4223, are both chlorinated organic sulfur compounds.

Reporting on these two chemicals before the American Phytopathological Society in annual session at Green Lake, Wis., August 29–31, Hercules plant pathologist E. Neil Pelletier remarked specifically on their potential for broad usefulness.

His greenhouse evaluation of the two materials showed these results: Applied to the soil, they provide good control of the soil-rotting organisms that attack cotton seedlings. Compound 3944 proved better than three commercial standards, resulting in seedling emergence and stands of 90 per cent when applied at an effective rate to the soil. In seed treatment tests, 3944 proved as effective as two standard commercial fungicides tested as protectants of corn and cucumbers, and was superior on peas and peanuts.

Field trials conducted at the Clemson College Truck Crop Experiment Station proved 4223 to be the best of six materials tested as an all-purpose vegetable seed treatment. Compound 3944 was as good as other effective commercial materials. Field evaluation of 3944 in regional interstate cotton seed treatment tests also was encouraging, Pelletier said.

The Hercules scientist also commented on the safe handling advantages of these two new chemicals. Hazard to warm blooded animals has proved extremely low, whether the chemical is taken into the stomach, the lungs, or applied to the skin.

CHEMICALS GIVE PEANUTS GOOD PROTECTION FROM STING NEMATODES

Use of effective chemicals to control sting nematodes can increase peanut yields by three to four times. Equally important, these chemicals do a good job whether they're applied before planting, at planting time, or six weeks after peanuts are planted.

Three North Carolina State College plant pathologists—J. N. Sasser, W. E. Cooper, and T. G. Bowery—made these discoveries in extensive studies conducted during the past year.

The scientist team got good results with broadcast treatments of a new, experimental non-volatile nematocide, EN 18133, and with soil injections of the volatile chemical, 1,2-dibromo-3-chloropropane.

The fact that treatment at planting time was as effective as pre-planting treatments suggests a money-saving advantage for growers in combining planting and treating operations. Although treating after planting was less effective, such a practice has the advantage of allowing growers a chance to save their crop when nematode infestations are discovered after the crop is started.

All effective treatments boosted yields, quality, and market value. In tests comparing the market value of peanuts grown from untreated and treated fields, pre-planting treatment sent up the value of a harvested acre from $76 to $309; treatment at planting time from $94 to $339; and post-planting treatment from $71 to $238.

Although these experiments resulted in very minute and safe amounts of bromide in shelled peanuts, the scientists felt that growers should use these chemical treatments with caution until further studies can evaluate the residue situation, particularly relating to the feeding of peanut hay to milk cows or livestock being finished for slaughter.

COMBINATION SEED TREATMENTS OFFER PROMISE FOR COTTON, SUGAR BEETS

Treating cotton and sugar beet seeds with a combination of fungicidal chemicals appears to be the best answer yet to damping off, a disease that can wipe out seedling stands of these crops.

Compared with the single-chemical seed treatment cotton growers now rely on, the combination treatment reduced damping off losses by more than a third. Results with sugar beets were even better—so good in fact that several sugar beet companies will use a combination treatment on a fairly large test basis next year. Wide use of combinations on cotton awaits the development of precise formulations that control damping off without any danger of chemical damage to seedlings.

Value of combination seed treatments was proved by a state-federal team of plant pathologists located at the University of California. Results of experiments were reported by the research team—L. D. Leach and W. J. Tolmsoff of the University and R. H. Garber of the U. S. Dept. of Agriculture. They figured that since more than one fungus caused damping off, a combination of fungicides selected for their effectiveness against each organism would give the best control. Their results bear this out.

Against the two fungi that are the major causes of damping off in cotton, combinations of Dexon and PCNB gave the best seedling emergence and survival. Also effective were combinations of Ceresan 100 and PCNB, Captan and PCNB, and Panogen 15 and PCNB. The first two combinations also were most effective in protecting sugar beet seedlings.

READER SERVICE

FREE INFORMATION to help you solve fertilizer, pesticide problems

Chemicals

301—FRONTIER BOOKLET

Frontier Chemical Co. reports publication of a new, 24-page booklet listing each of its products and describing the process of manufacture, grades, containers, etc. Among the products covered are BHC, technical grade pentachlorophenol, chlorine, and grain fumigants. Obtain your free copy by

CIRCLING 301 ON SERVICE CARD

302—AMIBEN

A full-color four-page brochure titled "Introducing Amiben, a new Pre-emergence Herbicide for Soybeans," is available from Amchem Products, Inc. Amiben is reported to be effective on both broadleaf weeds and grasses, with no lingering soil residues for succeeding crops. Applied as a spray or granular formulation, the product is reported to be selective, with very good crop tolerance. To receive a copy, just

CIRCLE 302 ON SERVICE CARD

303—LINE RIDER FORMULATIONS

Details on Line Rider formulations are contained in a new brochure available from Diamond Alkali Co. There are formulations for mixed brush, for maples and oaks, and for special conditions. Find out all about the line by

CIRCLING 303 ON SERVICE CARD

304—MICRO-CEL

Seventy-five per cent DDT concentration is possible with Micro-Cel, reports Johns-Manville, producer of the inert synthetic calcium silicate. Other high toxicant concentrations include 50% malathion, 70% toxaphene, 50% heptachlor, 75% aldrin and 50% aramite. Further information is available, by

CIRCLING 304 ON SERVICE CARD

305—TREBO-PHOS

American Cyanamid calls its Trebo-Phos "the triple superphosphate with controlled porosity for proper ammoniation." Finished product is a dry, drillable, well-conditioned fertilizer, Cyanamid reports. Complete information is available, by

CIRCLING 305 ON SERVICE CARD

306—EMULSIFIER PAIR

A new emulsifier pair from Stepan Chemical promises to simplify inventories and formulations for formulators of toxicant systems, Stepan reports. Called Toximul R and Toximul S, the pair will emulsify such pesticides as weed killers and chlorinated and phosphate insecticides. Another development, Toximul LF is used for soil insecticides and other toxicants in most liquid fertilizers. Complete information may be obtained on all three products by

CIRCLING 306 ON SERVICE CARD

Process Equipment

307—NEW BULLETIN ON METERS, FEEDERS

B-I-F Industries has just published a new, 8-page general bulletin which provides capsule information about many of its products and systems. Butterfly valves, supervisory control systems, totalizing meters, water and waste treatment equipment and systems, flow meters, process instrumentation, feeder for solids and liquids and blenders for liquids are covered. A copy will be yours, if you

CIRCLE 307 ON SERVICE CARD

308—PLIBRICO CATALOG

Profusely illustrated, Plibrico Co.'s new 24-page book gives data on drying, calcining and processing. Plibrico linings are one-piece, have no joints to cause needless maintenance, the book points out. Among the installations pictured are Plibrico-lined dryer furraces of a granulated fertilizer producer and a phosphate processor. The literature covers tail rings, furnace doors, clinker coolers, dust chambers, waste heat boilers, stacks and breechings, dryer furnaces and gypsum kettles. A free copy will be yours, just by

CIRCLING 308 ON SERVICE CARD

309—McDERMOTT COOLERS & DRYERS

A free 12-page booklet published by McDermott Brothers Co., Inc., includes diagrams, descriptions and on-the-job photographs. The company designs and builds drying and cooling equipment. For your copy of the free booklet

CIRCLE 309 ON SERVICE CARD

310 GRANULAR FERTILIZER PROCESSING EQUIPMENT

A 12-page, two-color bulletin, "Renneburg Continuous Granular Fertilizer Processing Equipment" has been published by Edw. Renneburg & Sons Co., and is available to readers. It pictures and describes the continuous combination ammoniator-granulator, dryer furnaces, dryers, coolers, air handling systems and pilot plant equipment. To obtain a copy

CIRCLE 310 ON SERVICE CARD

311—UNI-BLENDER

The Uni-Blender can solve many problems for you, if you mix, grind or blend, says Poulsen Co. It mixes, elevates, grinds and bags—"does almost everything but wind the clock," according to Poulsen. The standard Uni-Blender can handle six to eight 1200 to 1500 lb. batches of field strength dust an hour. A technical bulletin is available. Simply

CIRCLE 311 ON SERVICE CARD

312—INSECTICIDE GRINDING

The full line of Raymond insecticide grinding mills is described in a bulletin published by the Raymond Div. of Combustion Engineering, Inc. The Raymond Roller Mill is well adapted for sulfur grinding, its manufacturer reports, and it can also be used for handling concentrate formulations by making provisions to admit necessary amount of room air into the system. Get your copy of the bulletin, by

CIRCLING 312 ON SERVICE CARD

Materials Handling

313—BUCKET ELEVATOR CATALOG

Universal Hoist Co. has announced publication of a new bound catalog and reference manual containing complete information on its bucket elevators and trough-belt conveyors. Universal believes it to be the most all-inclusive reference publication available to the industry. It includes complete price, specification and dimensional data. To obtain your copy,

CIRCLE 313 ON SERVICE CARD

314—NEW FLOW SWITCH FROM SYNTRON

Syntron Co. announces development of a flow switch, Model FS 1, designed to respond to the lack of material at a critical point in a bulk material handling system and automatically correct the difficulty or sound an alarm. Flow of material past the switch deflects the flap and holds it out of operating position. When the flow stops and there is no material to hold the flap in a deflected position, it swings back into

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328—Two new Polymers
329—"Hooker Chemicals"
330—Bulk Truck Spreaders
331—Collapsible Flexi-Drums
332—Electric Walkie Trucks
333—Invert-A-Bins

operating position and actuates the switch. The switch may start an electromagnetic bin vibrator to break down arching or plugging in a bin, hopper or chute. It may start or stop a vibratory feeder supplying a bin. An alarm switch, either manual or audible, can be set up using the flow switch as energizing agent. For more complete information,

CIRCLE 314 ON SERVICE CARD

315—WENDNAGEL WOOD TANKS

Wendnagel & Co., Inc. says wood tanks are suitable for most chemical solutions with a pH between 2 and 11, and polymer liners extend the range from below zero to 14. The firm supplies lined and unlined, prefabricated and ready to erect, or completely erected tanks. Sulfuric acid, phosphoric acid, liquid fertilizers and urea are among the products that can be stored in its tanks, Wendnagel says For details,

CIRCLE 315 ON SERVICE CARD

316—THE 12B MICHIGAN

Tight-packed fertilizer will yield to the Michigan 12B tractor shovel, according to Clark Equipment Co. Capacity of the 12B is 3,000 pounds. Buckets are available to carry from 6 to 27 cubic feet. Details are available from the firm's Construction Machinery Div. Just

CIRCLE 316 ON SERVICE CARD

317—YALE'S NEW LIFT TRUCK LINE

Yale Materials Handling Div. reports that its new line of LP-Gas and gasoline powered industrial lift trucks feature design advances in power transmission, mast construction, compactness of size, operating speeds, stability and maintenance. It is being introduced in 3000, 4000 and 5000 pound capacity models in both cushion and pneumatic tire types. Full information on the line is available by

CIRCLING 317 ON SERVICE CARD

Packaging

318—RAYMOND ROTOMATIC

Fully automatic, all mechanical, the Raymond Rotomatic Bag Packer requires no outside motivation such as electricity or compressed air, reports Raymond Bag Corp. The machine is gravity operated, and uses the even balance scale principle to deliver accuracy. Complete details are available. Simply

CIRCLE 318 ON SERVICE CARD

319—NEW CHASE POLY-PLY

Chase Bag Co.'s new Poly-Ply multiwall bag features an entirely new construction. It combines a ply of light-weight sheet polyethylene and heavy-duty multiwall paper. This, the firm says, provides excellent moisture protection, extra strength, ease of handling, and flexibility even at temperatures below zero. The bag is available in 25-, 50- and 100-pound sizes. Learn more about this new product by

CIRCLING 319 ON SERVICE CARD

320—MULTIWALL GUIDE

A new 16-page "Multiwall Packaging Guide" containing information on basic types of multiwall bags, principal types of multiwall bag closures, proper storage and handling of multiwall bags, railway car and truck trailer bag loading systems and multiwall packaging equipment has been prepared by Bemis Bro. Bag Company. To get your free copy,

CIRCLE 320 ON SERVICE CARD

Application Equipment

321—BOOM EXTENSION FOR AGR. SPRAYERS

Announcement of a new spray nozzle has been made by Delavan Mfg. Co. Sold under the trade name Delavan BX, these tips are designed to offer additional coverage for spray booms at flow rates consistent with standard boom nozzles. They are available from 5 GPA through 10 GPA. Manufactured as both a single and double nozzle, the BX offers additional coverage ranging from 68" to 104" for single nozzles and from 153" to 194" for double nozzles when both are placed at 30" boom height. Complete information is available. Simply

CIRCLE 321 ON SERVICE CARD

322—NEW BROCHURE SHOWS SPREADER BODY

Information on its newest lime and fertilizer spreader bodies, the K-5 series, is detailed in a three-color brochure offered by Baughman Manufacturing Co. Available in three different body styles and with a choice of four types of drives, these bodies assure uniform distribution, Baughman reports. All you need do to get a copy, is

CIRCLE 322 ON SERVICE CARD

323—SELLERS SWATHMASTER

An eight-page, well-illustrated bulletin from Transland Aircraft covers the Sellers Swathmaster, for dusting, spraying, seeding or fertilizing. It changes from job to job by means of a simple resetting of the pilot control in a few seconds without any aerial applicating time lost for equipment changeover, modification or maintenance, Transland reports. The booklet describes how the Swathmaster works, its installation, and its advantages. For your free copy,

CIRCLE 323 ON SERVICE CARD

Miscellaneous

324—NEW ACCESSORY FOR COLEMAN INSTRUMENT

High volume output in flame analysis—as many as 1000 measurements per day on a single instrument—now is possible with the Autoflow Sample Handling System, reports Coleman Instruments Inc. The system is an accessory for the Model 21E Flame Photometer. The system reduces to a minimum the several steps ordinarily required in handling samples for flame analysis. Sample solution is introduced manually into an input funnel which feeds directly to the burner atomizer. On completion of the determination, a touch of the Autoflow button purges the sample chamber and readies the instrument for the next measurement. For additional information,

CIRCLE 324 ON SERVICE CARD

325—SOILTEX TEST FOR SOIL ACIDITY

Edwards Laboratory reports that its Soiltex tells if soil is acid, neutral or alkaline, and does it in one easy operation. Each kit will make 100 soil tests. A small quantity of soil is shaken with a few drops of the Soiltex solution in a paper boat. This boat is made from papers included in the carton. Reaction of the soil is obtained by comparing the color of the liquid with the Soiltex color chart. If you'd like complete information,

CIRCLE 325 ON SERVICE CARD

326—CONDULETS FOR CORROSIVE LOCATIONS

"Condulets for Corrosive Locations" is the title of a 20-page Crouse-Hinds bulletin, just reissued with additional information. The company makes electrical equipment for use under many different conditions causing corrosion. Corrosive substances are listed in tabular form with appropriate corrosion-resistant metals and finishes used in Crouse-Hinds Condulets. The booklet also contains brief descriptions of the metals and finishes, and includes listings of Plast-A-Coat Condulets for hazardous and non-hazardous locations. For your copy of the bulletin,

CIRCLE 326 ON SERVICE CARD

327—RESPIRATOR EQUIPT. SELECTOR TABLE

An industrial gas mask canister selector table, using 62 most common industrial gas and vapor hazards, is included in the latest Willson flyer on its respiratory protection equipment. Opposite each hazard are listed recommended canister, color guide, Bureau of Mines approval where applicable. The flyer shows the firm's full line of respiratory equipment. For your copy, simply

CIRCLE 327 ON SERVICE CARD

PATENT REVIEWS

By Dr. Melvin Nord

Production of Calcium Phosphate Fertilizer with Reduced Hygroscopicity

U. S. 2,942,967, issued June 28, 1960 to Paul Cadwell and assigned in part to Donald W. Lloyd, describes a method of producing a non-hygroscopic calcium phosphate fertilizer which may also exhibit increased water solubility if desired.

It has been found that the presence of calcium nitrate in nitric acid-digested phosphate fertilizers materially increases the hygroscopicity. The same is also true of other salts such as calcium chloride.

The fluorine component is present in the form of a fluorosilicate and in order to remove this component from the acid solution, potassium chloride is added to form potassium silico-fluoride which precipitates from the solution and may be readily separated by filtering.

Following the addition of the potassium chloride to the extent of the full calculated amount, the control of hygroscopicity can be accomplished in accordance with the form of treatment as shown in Fig. 1 by sulfating the fluoride-free rock solution. While any soluble sulfate, such as sodium sulfate or potassium sulfate, can be used, it is preferred from an economical standpoint to utilize ammonium sulfate, this particular sulfating agent not only being economically preferred but further being more efficient from the standpoint of eliminating the presence of hygroscopic salts. The treatment set forth in Fig. 1 can include the addition of sufficient ammonium sulfate to precipitate adequate calcium in the form of calcium sulfate solids to reduce the calcium-phosphate ratio to that which favors formation of dicalcium phosphate. Substantially all of the calcium above the dicalcium phosphate ratio is precipitated in the form of calcium sulfate and the solid calcium sulfate precipitate is removed by filtering. The calcium sulfate removed can then be treated with ammonium carbonate to form ammonium sulfate for subsequent reuse and chalk (calcium carbonate) as a by-product.

The rock solution resulting from the sulfating treatment will consist primarily of phosphoric acid, calcium nitrate, calcium chloride and potassium nitrate, the calcium salts being substantially reduced in concentration by the sulfating step. This solution may then be ammoniated to a *p*H of approximately 7, whereupon dicalcium and monocalcium phosphate precipitates and is readily separated by filtering. The solid portion will predominate in dicalcium phosphate under the conditions set forth. The liquid portion consists primarily of ammonium chloride, ammonium nitrate, and potassium nitrate.

Completing the Treatment

In completing the treatment, the salt containing liquid portion is concentrated by the application of heat, to remove the potash and nitrogen value-supplying salts which are of a less hygroscopic nature. The solubility of the nitrates forming a substantial part of the salt solution increases with temperature elevation at a faster rate than that of the chloride. The first crop of crystals obtained from the solution will tend to be high in nitrates and the mother liquor will increase in ammonium chloride concentration. By separating the first crop of crystals by filtering to secure a mother liquor high in ammonium chloride and low in potash, it is possible to obtain substantial separation of the components from which the plant food ingredients are obtained. With the separated potash and nitrogen-supplying mother liquor, recombining of the various ingredients with the solid phosphate can be readily obtained on a commercial basis to provide a substantially non-hygroscopic product relatively free of diluents to allow incorporation of high weight plant food values on an equal rate ratio basis which will provide a final product of a grade higher than 12-12-12. Thus, upon proper analysis of the precipitated salts and remaining mother liquor, given quantities of each may be added to the dicalcium phosphate solids to provide a basic 1-1-1 product. The product can then be suitably dried and will be found to be substantially non-hygroscopic while in addition containing a substantially increased number of plant food units to provide for increased food value on the order of a 15-15-15 mix if desired.

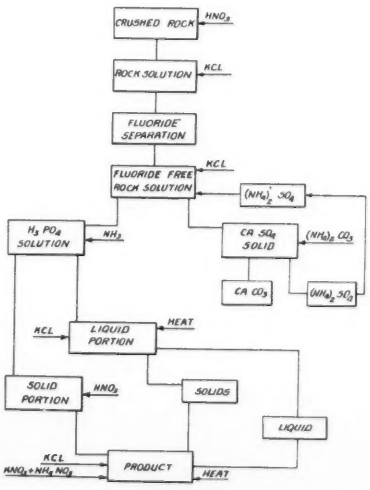


Figure 1.

PESTICIDES

U. S. 2,940,894, issued June 14, 1960 to W. E. Craig and John O. Van Hook, assigned to Rohm & Haas Co., describes a method for controlling nematodes, employing amino-isobutyronitriles.

U. S. 2,941,921, issued June 21, 1960 to Walter A. Darlington and assigned to Monsanto Chemical Co., describes a method of inhibiting the multiplication of plant viruses by applying to living plants a quantity of a compound of the formula

$$R'—N(R'')—Ar—Y$$

where Ar is aryl (6-12 carbon atoms), R′ and R″ are hydrogen or alkyl (1-18 carbon atoms), and Y is hydroxyl or thiol. ▲

Stauffer Chemical's

High Gamma BHC Process

BENZENE HEXACHLORIDE, BHC, is considered to have been the second important breakthrough in the development of modern organic pesticides. Discovered simultaneously in England and in France during World War II, its use followed quickly upon the heels of the very rapid development of DDT. Like DDT, BHC controls a wide range of insect pests important to agriculture, is persistent and thus gives long protection to the crop, and is not particularly hazardous to the applicator.

Chemists investigating the structure of BHC learned early that it is composed of several isomers, the most active of which is the gamma isomer. This isomer has been isolated and refined, and is known and used as lindane. Since all other isomers are virtually waste products, a number of research organizations quickly embarked on a program to develop a process for making BHC having a relatively high gamma content.

UNIQUE FEATURES

Such a program was initiated in the research laboratories of Stauffer Chemical Company and the work paid off with the discovery of a process with several unique features.

Until the development of this process, all the BHC produced in the United States was made by chlorinating benzene, utilizing excess benzene as the solvent. These products were low in gamma isomer content and contained, as impurities, benzene tetrachlorides and heptachlorides which are responsible for the overpowering, persistant odor of most commercially available BHC. This odor is not important on crops like cotton and tobacco, but prevents the use of BHC on edible crops.

In the patented Stauffer development, benzene is chlorinated at a low temperature in a complex solvent system which utilizes acetic anhydride and carbon tetrachloride as the chief constituents. The concentration of chlorine in the system is constantly monitored by a Stauffer designed automatic analyzer. Residual chlorine is removed from the product in a secondary reactor and two continuous stripping steps are employed to remove residual solvents. From the stripping operation the product, in molten form, is pelletized, air dried and bagged for shipment.

Under the special conditions of the Stauffer process, being commercially used at the Torrance, California, plant a BHC product containing 26 per cent of the desired gamma isomer is produced. It is almost completely free from the malodorous benzene tetrachlorides and heptachlorides. Its purity and pellitized form make it unequaled in terms of odor and ease of handling and processing.

The bulk of the pelletized BHC produced by the facility is shipped to Stauffer's Houston, Texas plant where it is ground and converted to an 18% dust base. From there the dust base goes to the company's and other formulating plants in the cotton producing areas for conversion to finished cotton dusts—often in conjunction with DDT or other toxicants. Thus, Stauffer is able to take immediate advantage of the superior grind ability, ease of handling and low odor characteristics of this product.

Substantial amounts of the pelletized material, however, are sold to other formulators direct mainly in the Texas and Mississippi Delta and Arizona cotton areas. ▲

Pelletized high gamma BHC is ground and diluted to an 18% dust base at Stauffer's Houston, Texas plant for shipment to formulators of finished cotton dusts.

IMC has tabulated service calls to learn most common technical problems encountered by fertilizer makers. Now the company is employing two relatively new concepts of assistance.

WHAT'S YOUR PROBLEM?

THE MOST persistent technical problems facing the fertilizer manufacturer today are those involving semi-granulation, formulation, and granular production.

This is the conclusion reached after tabulation of service calls for the early months of operation of the recently organized technical service staff of International Minerals & Chemical Corporation.

The reports are believed to be a reliable barometer of the industry's technical problems, coming from IMC's five technical service regions covering the United States and Canada east of the Rocky Mountains.

General service calls, with no one problem standing out, accounted for 113 of the total of 445. The remaining 332 were divided as follows:

Semi-granulation	50
Formulation	48
Granular production	42
Equipment and production	37
General production	37
Product service call	30
Pan granulator	18
Liquid fertilizer	17
X-O-X production & preneutralization	16
Bulk blending	16
Acidulation	14
Specialty grades	7

SEMI-GRANULATION PROBLEMS

Problems in semi-granulation, which headed the list with 50 calls, have multiplied as smaller plants seek to meet the competition of the fully granulated plants, in the opinion of Richard G. Powell, IMC Manager of Technical Service.

"Semi-granular units generally are installed as stop-gap measures to let the owner decide whether to go ahead with investment in the more expensive full granulation unit," Powell explained. "The conversion of a plant producing pulverized fertilizers to semi-granular operation provides problems in particle sizes, nitrogen losses, and other areas."

TWO KINDS OF FORMULATION PROBLEMS

He noted that formulation problems, second highest at 48, most frequently cover two categories—the most economical way of formulating for the exact product desired, and the avoidance of off-analysis materials through losses and overages. Trained technical service men have been very successful in assisting in all areas of formulation.

Granular production, next in line with 42 requests, is tied closely to formulation, Powell noted. He said granulating unit owners constantly seek a minimum of recycling and maximum of on-size materials to get the most from their equipment.

The classifications "general production" and "equipment and production" were differentiated in that the former refers to a complete re-evaluation of the entire production system of a given plant; the latter indicates that technical service was called on regarding a specific piece of equipment and its relation to the production problem.

IMC TRIES TWO NEW CONCEPTS

IMC's technical service department currently is working on two relatively new concepts, Powell said.

One is an attempt to categorize and "can" certain information which seems to be requested most frequently. For example when a fertilizer manufacturer requests help on material handling systems, unit operations, types of buildings, and other subjects, all pertinent information would already be packaged.

Proposed layouts, cost estimates, and other vital data would be supplied immediately upon request. Even when individual cases varied slightly, the "canned" information would provide a starting point and would move the problem to solution more quickly.

The second new step is the previously announced series of fertilizer training clinics to be conducted in 11 cities this fall by IMC. Featuring technical service, these clinics will offer discussion and solutions to some of the more vital problems presented by fertilizer manufacturers.

More than 400 representatives of fertilizer manufacturing companies are expected to attend. Schedule of meetings:

October 24–25, Minneapolis; October 26–27, Indianapolis; November 9–10, Baltimore; November 14–15, New York City; November 16–17, Raleigh, N.C.; November 21–22, Toledo, Ohio; November 28–29, Winter Park, Fla.; November 30–December 1, Montgomery, Ala.; December 5–6, Kansas City; December 12–13, Tyler, Texas; December 14–15, Jackson, Mississippi. ▲

NEWS OF THE INDUSTRY

USI EXPANDS AMMONIA PRODUCTION, STORAGE CAP.

Ammonia production capacity has been increased by 17 per cent, and anhydrous ammonia storage capacity will be expanded by U.S. Industrial Chemicals Co., division of National Distillers and Chemicals Corp. at its Tuscola, Ill., plant. Paul J. LaMarche, USI director of production, reports that the plant is already operating at the expanded rate of 70,000 tons per year (up from 60,000 tons) and a new 6,000 ton storage facility is expected to be in full service by the end of the year.

The storage tank will use the relatively new principle of storing refrigerated ammonia at atmospheric pressure, rather than storing it in pressurized tanks at moderate pressures.

FORAGE & FERTILITY

Forage crops require high fertility, according to Floyd Smith, widely recognized Kansas State College authority on soil fertility questions.

More and more dairy and beef farmers are beginning to agree with Dr. Smith, because they have found that you cannot separate good animal nutrition from good crop nutrition.

High-producing dairy and beef cattle need more diet than carbohydrage roughage or bulk forage, according to Dr. Smith. They need a diet with plenty of mineral nutrients in it. Such crops as alfalfa and alfalfa-grass mixtures produce a high mineral crop-diet, including all-important protein. But to do so, they themselves require a diet of sufficient soil nutrients. "It requires about 75 pounds of calcium, 13 pounds of phosphorus (30 lbs. P_2O_5) and 75 pounds of potassium (90 pounds of K_2O) to produce 2.5 tons of alfalfa hay," Dr. Smith advises.

Complete details on the Smith study can be secured by writing Better Crops Report, Number T-12-59, American Potash Institute, Inc., 1102-16th St., N.W., Washington 6, D.C.

CSC INCREASES DIVIDEND

Commercial Solvents Corp.'s board of directors declared an increased regular dividend of 15 cents per share on outstanding common stock of the corporation, paid Sept. 30, 1960, to stockholders of record at the close of business on Sept. 2, 1960.

Previous payment was 10 cents per share on June 30, 1960.

PENNSALT TO ACQUIRE INTEREST IN DUTCH FIRM

Pennsalt Chemicals Corp. has announced it would acquire an interest in Vondelingenplaat, a Netherlands chemical company.

Pennsalt plans to spend $2 million on facilities to manufacture tertiary dodecylmercaptan and other organic sulfur compounds at the plant of Vondelingenplaat located on the Nieuwe Maas waterway near Rotterdam.

It is reported that Pennsalt expects to introduce a Vondelingenplaat pesticide line in the United States, Mexico and Canada.

FERTILIZER PRODUCTION, USE IN OEEC COUNTRIES

In all Organization for European Economic Cooperation countries, production of fertilizers continued its upward movement in 1958–59. Member countries are Austria, Belgium, Denmark, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, and the United Kingdom.

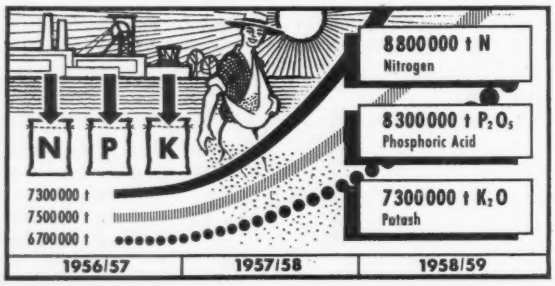
While there was some slowing down in the rate of expansion of nitrogen output, production nevertheless rose by 8 per cent to reach 3.7 million tons of N. Output of phosphate fertilization also increased considerably compared with 1957–58 (by 6 per cent) to reach 3.7 million tons of P_2O_5, while steady rate of expansion of 1957–58 (3 per cent) was maintained for potash fertilizers. Production totaled 3.4 million tons of K_2O in 1958–59.

Total consumption of fertilizers in the OEEC area rose in the 1958–59 season, and the trend is expected to continue in 1959–60.

In 1958–59 consumption of nitrogenous fertilizers reached 2.8 million tons and that of phosphate and potash fertilizers 3.4 and 3.0 million tons, respectively. This represents a 7 per cent increase for nitrogenous fertilizers over 1957–58 and a 3 per cent increase for both phosphate and potash fertilizers.

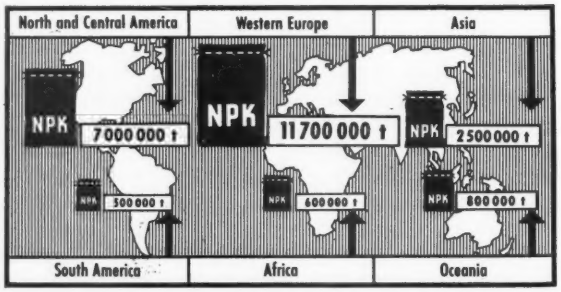
Forecasts for 1959–60 show a rate of increase of 6 per cent for nitrogenous and phosphate fertilizers, while a 5 per cent increase is forecast for potash fertilizers.

World Production of N, P_2O_5 and K_2O



Estimated world production of nitrogen, phosphoric acid and potash in 1958–59 was nearly 8 per cent greater than the figure for 1957–58 and more than 13 per cent higher than 1956–57.

World Fertilizer Consumption 1958-1959



Out of the 23.1 million tons of world consumption of fertilizer in 1958–59, about 80 per cent was consumed in Western Europe and North and Central America. Half of the total 2.5 million tons used in Asia is applied in Japan.

CYANAMID TO DOUBLE OUTPUT OF W.P. PHOSPHORIC ACID

Plans to double American Cyanamid Co.'s production of wet-process phosphoric acid have been announced by Wilbur G. Malcolm, president.

A multi-million dollar addition will be made at the company's Brewster, Fla., plant to handle the increased production, Dr. Malcolm said. With the planned addition, the plant will be capable of producing about 400,000 tons of wet-process 54% phosphoric acid annually.

Use of phosphoric acid in high-analysis fertilizer has been gaining wide acceptance since early 1957. Dr. Malcolm listed the following reasons for this acceptance:

▶ When phosphoric acid is used in formulation of granular mixed fertilizer, the total cost of raw materials used in the fertilizer is lowered. The amounts of sulfuric acid and triple superphosphate needed in a formula are eliminated or reduced, and the amounts of lower-cost normal superphosphate and anhydrous ammonia that can be used are increased.

▶ Wet-process phosphoric acid contains small amounts of sulfuric acid and iron and aluminum phosphates, which impart properties that make the fertilizer mixture easier to granulate.

▶ Wet-process phosphoric acid also contains desirable trace elements—sulfur, iron, aluminum, manganese, zinc, calcium and magnesium.

▶ Wet-process phosphoric acid is rapidly replacing higher-cost furnace-process phosphoric acid in the manufacture of liquid mixed fertilizers.

The new facilities will also provide an increased tonnage of triple superphosphate. This product and phosphoric acid will be marketed by Cyanamid's Agricultural Division.

The widest use of fertilizers containing phosphoric acid is in the midwest and south central states. Cyanamid's two-fold increase in production and efficient distribution facilities will assure prompt service to its customers in those areas, Dr. Malcolm said.

NEW API MOVIE: GROWING ALFALFA SUCCESSFULLY

A new motion picture on how to grow alfalfa successfully has been released by the American Potash Institute. It features special time-lapse photography to show how the plant grows and feeds.

Produced for use by agricultural college personnel, county agents, vo-ag teachers and other specialists in official agriculture and industry, the 16mm color movie is 25 minutes long. It presents the value and uses of alfalfa, its origin and introduction into North America, soil and nutrient requirements of the crop. It features the latest management techniques, including fertilization and liming, seeding, inoculation, cutting and control of weeds, insects and diseases.

The movie can be booked free of charge by contacting the Visual Education Service of the American Potash Institute, 1102–16th St., N.W., Washington 6, D.C., giving a date and an alternate desired for showing, name and organization represented.

AWARD TO EMPLOYEES

Operating personnel of Olin Mathieson's sulfuric acid plant at North Little Rock, Ark., have received a special safety award.

J. S. Gilliam, director of operations for Olin Mathieson, who presented the award, said that it was for completion of 1,241 working days without one disabling accident. The period included 113,548 man hours.

The Manufacturing Chemists' Association gave a "Certificate of Achievement" for the Mathieson plant's 1959 safety record. It was the third one received by the plant from MCA.

MONTECATINI ACQUIRES VETROCOKE CO.

Shareholders of Montecatini have approved a 50% increase in the company's capital stock from 100 billion lire to 150 billion lire and approved merger into Montecatini of Vetrocoke Co., an Italian manufacturer of nitrogen fertilizers, glass and coke products, located in Venice.

SASOL N TO BE USED IN NEW PLANT AT FISONS

Fisons, which has a £2½ m. fertilizer factory at Sasolburg, South Africa, is planning to add to it an expensive plant to make nitrogenous fertilizer with nitrogen which will be available from Sasol, the oil-from-coal plant in the Northern Free State. The new project is expected to be taking shape at about this time next year.

Sasol proposes to increase production capacity for nitrogen by the manufacture of synthetic ammonia, and they also intend to produce nitric acid.

Bill Lyons, right, golf superintendent for Firestone Tire & Rubber Co., shows Bertie Way, left, designer of the original Firestone course at Akron in 1928, and Loren Tibbals, general chairman of the Professional Golfers' Assn., the fine condition of the greens. Lyons, starting with little more than bare earth, put the course into shape for the recently-held PGA Championship matches in only 82 days, using Ammo-Phos 13-13-13, a product of Olin Mathieson Chemical Corp.

FARM FERTILIZERS CONDUCTS DEALER SCHOOLS

Twenty dealers will be attending dealer schools on Sept. 27 and 28, Nov. 29 and 30, Feb. 29 and March 1, 1961 and Sept. 26 and 27 at the Cornhusker Hotel, Lincoln, Neb. The schools are being conducted by Ralph Everett of Empire Sales Training for Farm Fertilizers, Inc., of Omaha, Neb.

At the Whitney Hotel in Atlantic, Iowa, schools will be held Sept. 29, 30, Dec. 1 and 2, March 2 and 3, 1961 and Sept. 28 and 29, 1961.

DOW DIVIDEND

The Dow Chemical Co.'s board of directors has declared a 2 per cent stock dividend—one share for each 50 held—in addition to a quarterly cash dividend of 35 cents per share on its common stock.

Both are payable to stockholders of record at the close of business Sept. 16. The cash dividend is payable on Oct. 15, 1960 and the stock dividend on Nov. 1, 1960.

O.M. GETS $25 MILLION ROCKET FUEL CONTRACT

A $25 million contract calling for delivery of the chemical rocket fuel, hydrazine, to the U.S. Air Force for use in the Titan II Intercontinental Ballistic Missile has been awarded to Olin Mathieson Chemical Corp., reports Stanley de J. Osborne, president. Deliveries will begin in 1961 and continue for three years.

A major part of the storable fuel for the Titan II, hydrazine will be made at a new plant at Saltville, Va., being built by Olin Mathieson for the Air Force, Osborne said. The new plant will cost more than $14 million.

USI DOUBLES POLYETHYLENE CAP. AT HOUSTON PLANT

A new section of National Distillers' U.S.I. Division polyethylene production plant at Houston, Tex., has just gone on stream. The installation doubles the capacity of this plant, and is reported to establish USI as the second-largest producer of polyethylene in the world.

This latest expansion brings USI's total production capacity of Petrothene low and medium density polyethylene resins to 300 million pounds per year.

Associations Meetings

NORTHEASTERN CONFERENCE HELD AT HERSHEY

Fertilizer practices in the Northeast, sales promotion and advertising, and coordinated marketing were discussed at the Northeastern Fertilizer Conference, Hershey, Pa., September 29 and 30.

W. H. Garman, National Plant Food Institute Northeastern regional director, welcomed delegates to the meeting. C. R. Skogley, University of Rhode Island, had as his topic, "The Non-Farm Fertilizer Market in the Northeast. What is the Market Potential?"

"Fertilizer Practices in the Northeast" were discussed by Dr. J. C. Harper of The Pennsylvania State University, who covered intensively used turf, and Joseph Troll of the Univ. of Massachusetts who spoke on less intensively used turf.

H. H. Iurka, New York Department of Public Works, spoke on "Establishment of Roadside Turf" and E. F. Button, Connecticut State Highway Department, on "Maintenance of Roadside Turf."

C. F. Winchell, of Consolidated Rendering Co., reported on "The Agronomic Approach to Sound Advertising," and A. E. Buter, of Nitrogen Div., Allied Chemical Corp. offered "Merchandising Techniques for the Non-Farm Market."

"What Makes a Star Salesman a Star" was revealed by H. B. "Doc" Sharer of U. S. Rubber Co. Concluding presentation, "A Coordinated Marketing Program for the Plant Food Industry," was made by Dr. Hector Lazo, Graduate School of Business Administration, New York University.

PRINCIPLES OF FERTILIZER PLACEMENT DESCRIBED

"Proper placement of fertilizer is beginning to rank with proper amounts in the minds of today's farmers," Werner L. Nelson, Midwest director of the American Potash Institute, told the annual meeting of the American Society for Horticultural Science on the campus of Oklahoma State University on August 29.

The annual meeting of 20 biological societies affiliated with the American Institute of Biological Sciences is one of the largest scientific meetings in the nation, featuring 1,200 lectures. Representing the National Joint Committee on Fertilizer Application, Dr. Nelson told the horticultural group that "many scientists believe improper placement has been limiting fertilizer use."

He listed two main objectives of safe, efficient fertilizer placement: "To avoid injury to seedlings and to provide efficient use of nutrients from start to maturity."

Dr. Nelson's talk was based on the American Potash Institute's new slide set on fertilizer placement.

SOUTHWESTERN CONFERENCE ATTRACTED OVER 260 PEOPLE

More than 260 industry representatives, college personnel and control officials attended the 1960 Southwestern Fertilizer Conference and Grade Hearing July 27–30 at Galveston, Tex.

Stanley Hackett, chairman of the Southwestern Fertilizer Conference Committee, presided over the general session. Dr. R. L. Beacher and W. R. Allstetter of the National Plant Food Institute opened the program with a discussion of NPFI activities both nationally and regionally. They introduced E. K. Chandler who soon will assume duties as Southwestern district representative in Shreveport for NPFI. Chandler had been located in Knoxville, Tenn.

Dr. M. B. Sturgis, head of the Department of Agronomy at LSU, outlined the importance of fertilizers to Louisiana agriculture. C. B. Spencer of the Texas Cottonseed Crushers Assn. said that nearly one-half of the six million acres of Texas cotton received no fertilizer last year. He noted that opportunity for increased fertilizer use is greatest in the Blackland and in central Texas.

Dr. John E. Hutchison, director of the Texas Agricultural Extension Service, outlined the progress of the Texas intensified soil fertility program which started in the fall of 1959. He noted that the number of soil samples processed this year for the 13 counties jumped 300 per cent over the previous year.

Woody N. Miley, Arkansas extension soil specialist, told how the Arkansas' demonstration and intensified soil fertility program led to a boost in fertilizer consumption

Photos from the Conference

S. M. Hackett, chairman, presents award to M. S. Perkins for 65 years service in the Louisiana Department of Agriculture.

A. T. Edwards, Red Star Fertilizer; A. L. McQuarry, Delta Fertilizer; and Gene Morgan, American Cyanamid, have a chat.

John Beatty, Olin Mathieson Chemical, gets together with Bob Heck, International Minerals and Chemical Corporation.

"Dugan" Taylor, John Deere Chemical Co., takes time out for coffee with Dean Gidney, of Potash Company of America.

of 9 per cent during 1959–60 in the five-county intensified area. Enoch T. Nix, vice president of the American Bank of Boosier City, La., said that the farmer who used fertilizer properly is a better credit risk.

Keynote speaker was Ralph Everett, director of Empire Sales Training Co. in Miami.

Fertilizer grades approved for the coming year and consumption figures for the 1959–60 year to date were reported by fertilizer control officials and land-grant college representatives from Arkansas, Louisiana, New Mexico, Oklahoma and Texas. In Arkansas, total fertilizer consumption moved up to 362,000 tons in 1959–60 from 353,000 in 1958–59. Louisiana showed a 1 per cent increase in total tonnage for the nine-month period of September through May and an 11 per cent increase in use of approved fertilizer grades. Oklahoma's total tonnage moved from 133,000 in 1958–59 to 145,000 in 1959–60.

The conference will again be held in the Galvez Hotel next year, July 19–21, 1961.

Kevin Kelly, Sponge Rubber Products Div., B. F. Goodrich, emphasizes to managers attending a supervisory training school the responsibility of management for establishing an effective safety program.

Elmer Perrine, Nitrogen Div., Allied Chemical Corp. and chairman of the Fertilizer Section, NSC, discusses handling of liquids in fertilizer plants at one of the regional supervisory training schools.

SUPERVISORY TRAINING CUTS ACCIDENT RATE

Want to cut accidents in your plants in half? It's a fact that accident frequency rate in the fertilizer industry nationally in 1959 was 22.2 per one million man-hours, compared with 10.6 for members in the National Safety Council, NSC reports. Membership does not guarantee this result, but it does mean that sound business managers of many fertilizer companies have recognized the need for an accident prevention program and have enlisted the services of the Council to help build and maintain a sound safety program.

Training of supervisors in accident prevention is necessary. Both the National Plant Food Institute and the Fertilizer Section of the National Safety Council have jointly sponsored a series of supervisory safety training schools. They are about to be concluded with one for the Far West region of the country on Oct. 26 and 27 at the Hacienda Motel, Fresno, Calif., and the other for the Southwest region on Nov. 8 and 9 at the Jung Hotel, New Orleans, La.

A good place to start on the road to a successful safety program is the National Safety Congress in Chicago. The Fertilizer Section will hold its meetings in the Morrison Hotel on Oct. 17 and 18.

NFSA TO MEET NOV. 9-11

Association President Hugh S. Surles, Jr., of Planters Cotton Oil & Fertilizer Co., says the Nov. 9–11 meeting will be the greatest convention the National Fertilizer Solutions Association ever had. To be held at the Peabody Hotel in Memphis, Tenn., the convention is being planned by a committee with John L. Wilson, of Sangamon Grace Ammonia Co., as chairman.

Highlight of the meeting is an address by Earl C. Nightingale on "Management's Strangest Secret."

Industry speakers will cover many facets of product promotion. Robert C. Lemler of Aylco Corp., Sullivan, Ill., will speak on "Selling the Farmer;" F. E. Hartzler of Kansas State Teachers College on "Management Practices;" and a panel will review engineering developments, old and new; water soluble phosphates, and ten years

Calendar

Oct. 5-6. Southeast Fertilizer Conference, Atlanta Biltmore Hotel, Atlanta, Ga.

Oct. 10-11. Four-State Aerial Applicators Conference, sponsored by Norkem Corp., Hotel Chinook, Yakima, Wash.

Oct. 10-12. Assn. of Official Agricultural Chemists Meeting, The Shoreham, Washington, D. C.

Oct. 14. Assn. of American Fertilizer Control Officials Annual Meeting, The Shoreham, Washington, D. C.

Oct. 17-18. National Safety Council, Fertilizer Section, National Safety Congress, Chicago, Ill.

Oct. 19. Executive Committee, National Safety Council, Fertilizer Section, Chicago, Illinois

Oct. 25. Assn. of Consulting Chemists & Chemical Engineers Annual Meeting, Shelburne Hotel, New York City.

Oct. 27-28. Meeting of Eastern Branch, Entomological Society of America, Hotel New Yorker, New York City.

Oct. 31-Nov. 2. Packaging Institute Annual National Packaging Forum, Statler Hilton, New York City.

Nov. 2-4. Fertilizer Industry Round Table, The Mayflower, Washington, D. C.

Nov. 3-4. Annual Convention, Pacific Northwest Plant Food Assn., Boise, Idaho.

Nov. 9-11. National Fertilizer Solutions Association, Peabody Hotel, Memphis, Tenn.

Nov. 13-15. 37th Annual California Fertilizer Association Convention, del Coronado Hotel, Coronado, Calif.

Nov. 14. Annual Sales Clinic of Salesmen's Assn. of the American Chemical Industry, Roosevelt Hotel, New York City.

Nov. 15-16. Second Annual Farm Chemicals Marketing Seminar, Delmonico Hotel, New York City.

Nov. 28-Dec. 1. Entomological Society of America Annual Meeting, Chalfonte Haddon-Hall, Atlantic City, N. J.

Dec. 5-9. American Society of Agronomy Meeting, Morrison Hotel, Chicago, Ill.

Nov. 29. Oklahoma Fertilizer Dealers' Conference, Huckins Hotel, Oklahoma City.

Nov. 30. New Jersey Fertilizer Conference, sponsored by Plant Food Educational Society of New Jersey, Rutgers University, New Brunswick.

Dec. 12-14. North Central Weed Control Conference, Hotel Schroeder, Milwaukee, Wis.

Jan. 4-6. Northeastern Weed Control Conference, Hotel New Yorker, New York City.

Jan. 5-7. Agricultural Aircraft Association Annual Convention, Hotel El Dorado, Fresno, Calif.

of liquid fertilizer. Panel members are Morris T. Woosley, West Kentucky Liquid Fertilizer Co.; Dr. John L. Strauss, Ris-Van, Inc.; Dean R. McHard, Kaw Fertilizer Service; and Dermont Galbraith, Agriform of Northern California.

Entertainment planned includes the annual banquet and a "Cat Fish Fry."

WILSON TO MANAGE PNPFA

John Wilson, manager of the Washington State Feed Association, has been named by the board of directors of the Pacific Northwest Plant Food Association as secretary-manager of the association to succeed Leon S. Jackson, who resigned for health reasons.

Headquarters of the association are now 814 Second Avenue Building, Seattle 4, Wash.

People

The American Agricultural Chemical Co. Harold L. Ward joins the firm to specialize in market research and development under Dr. G. H. Benham, director of research. Ward will assist in coordinating the company's research activities with its overall operations and objectives, and will work with AAC customers in developing markets for new products. He will make his headquarters at the company's research facilities at Carteret, N. J.

Ward

American Cyanamid Co. Promotion of Dr. J. H. Ware to director of the product laboratory of the Agricultural Div. has been announced by Dr. J. T. Thurston, manager of research and development for the division. Dr. Ware's new responsibilities involve physical and chemical formulation studies of experimental chemicals and drugs for plant and animal use, and analytical procedures for proving the safety, effectiveness and stability of all Agricultural Div. Products.

American Potash & Chemical Corp. William W. Young has been named southern area regional sales manager, reports Dr. A. J. Dirksen, general sales manager, Eastern. Young, who will open the company's first regional headquarters at Atlanta in the near future, will have sales and administrative responsibility for the Atlanta and Shreveport district offices.

Niven D. Morgan, Jr., former sales representative at Shreveport, replaces Young as district manager at that office.

Young

Morgan

Jones

John R. Jones becomes New York-New England district sales manager for American Potash. He will continue to headquarter out of the firm's eastern general sales offices in New York.

California Spray-Chemical Corp. James D. Wood and John Burleigh Clapp, Jr. are new branch managers for the firm, Wood at Hart, Mich., serving the major part of the state, and Clapp for New England, with office at Hudson, Mass.

Chemagro Corp. Dr. Robert W. Earhart, research biologist, has been appointed assistant supervisor in the company's research program. He is responsible for greenhouse and field plot testing of new agricultural chemicals being developed by Chemagro.

Earhart

Samuel F. Stewart goes to Chemagro as a sales representative. With headquarters in Carlisle, Pa., he will service a territory that includes Pennsylvania, New Jersey, Maryland and Delaware.

Commercial Solvents Corp. Dr. Carl F. Prutton has been elected to the board of directors of CSC. He is a director of Food Machinery and Chemical Corp. and a consultant for several chemical companies. Dr. Prutton retired recently as executive vice president, Chemical Divisions of FMC, and was formerly vice president, director of operations, engineering and research of Mathieson Chemical Corp.

Prutton

Freeport Sulphur Co. Thomas R. Vaughan has been elected vice president and general counsel and John C. Carrington vice president of sales by the board of directors.

Carrington

Carrington joined the company in 1939 as assistant to vice president. He was made director of personnel relations in 1945 and director of public relations in 1946. In 1947 he was elected assistant to president and, in 1952, vice president.

General Chemical Division, Allied Chemical Corp. Appointment of Harold R. Schneider as assistant sales manager for agricultural chemicals has been announced by John L. Damon, director of agricultural chemicals.

With the division 14 years, Schneider has been executive assistant for agricultural chemicals for the past four years.

W. R. Grace & Co. J. Peter Grace, president, has announced that Osgood V. Tracy, formerly president of Esso Standard, divi-

sion of Humble Oil & Refining Co. and affiliate of Standard Oil Co. (New Jersey) has been elected a director and an executive vice president of W. R. Grace & Co.

Tracy fills the post held by the late Marlin G. Geiger who died May 13. Tracy will be in charge of the chemical business of Grace and will be responsible for the seven operating divisions as well as the Research Div. comprising the Grace Chemical Group.

Great Western Chemical Co. Lee R. Hansen has been named manager of the Agricultural Chemical Dept. for the West Coast. Hansen has 15 years of experience in the farm chemicals sales field, formerly with L. H. Butcher Co., Olin-Mathieson Chemical Corp. and United States Borax and Chemical Corp.

Hansen

International Minerals & Chemical Corp. Two promotions in the Plant Food Div. have been announced by John Zigler, vice president:

Dick Lenz to sales supervisor of the Mason City, Iowa, district, and George Donaldson to superintendent of the Fort Worth, Tex., fertilizer plant.

A. R. Maas Chemical Co., Division of Stauffer Chemical Co., has promoted James R. Bothel to assistant general manager and Charles W. Stager to production superintendent. Bothel was assistant to the general manager and Stager, plant superintendent.

Monsanto Chemical Co. Ernest S. Robson of New York, a director of sales operations for the Organic Chemicals Div., transferred to St. Louis on Sept. 1 in a move to consolidate the sales management function at division headquarters.

Robson has responsibility for supervision of the Organic division's district sales offices at New York, Everett, Mass., Syracuse, N.Y., Pittsburgh, Wilmington, Del. and Atlanta, Ga.

National Plant Food Institute Dr. James M. Brown, formerly agronomy extension specialist for the North Carolina Extension Service, has been named district representative for the Institute covering the states of Alabama, Mississippi and Tennessee. Dr. Brown will make his headquarters at 1071 Terrace Acres, Auburn, Ala.

Brown

Olin Mathieson Chemical Corp. has promoted five executives: N. Harvey Collisson, former corporate vice president in charge of Metals Div., becomes senior vice president and chairman of the staff committee. Milton L. Herzog succeeds Collisson as vice president and general manager, Metals Div.

Collisson

Richard M. Furlaud has been named vice president and general manager of the corporation's International Div., succeeding Henry A. Arnold who has been named a senior advisor of the corporation and continues as a corporate vice president.

Gordon Grand, Jr. has been assigned the additional responsibilities of the office of the general counsel and appointed vice president for law and administration.

Arthur T. Safford, Jr., formerly director of marketing, has been named corporate vice president for marketing. He succeeds Donald A. Drummond who remains a corporate vice president and becomes a senior advisor.

Stanley de J. Osborne, president and chief executive officer of Olin Mathieson, has been elected a trustee-at-large on the board of the

Independent College Funds of America.

Pacific Chemical and Fertilizer Co. Louis Maurina, Kauai manager, recently took over the Hilo branch. Mike Pederman, sales representative, becomes acting manager of the Kauai branch.

Phillips Petroleum Co. L. H. Wright, assistant sales manager, has been placed in charge of the administrative supervision of LP-Gas and fertilizer sales. R. S. McConnell moves up to manager of fertilizer sales.

Potash Co. of America. has appointed two new sales representatives: William "Bill" John for portions of the states of Missouri, Kentucky, Indiana and Illinois. Residing in Effingham, Ill., John will be under general supervision of F. H. Kennedy, midwestern sales manager.

Lavoid Holloway will cover Texas, Mississippi, Louisiana and

John

Holloway

Arkansas, under general supervision of W. H. Appleton, southern sales manager. He will make his headquarters in Little Rock.

Smith-Douglass Co. Inc. Laramie J. Clark, an agricultural graduate of the University of Illinois, has been named sales representative in central Illinois. He will live in Lincoln.

Spencer Chemical Co. New territorial assignments: In the North-Central Sales District, F. A. McGuire becomes special accounts representative. His post as Illinois sales representative will be filled by Ned Haldeman. Paul Potterton moves to the district as representative for direct application solutions, and Charles Majors goes to the district as a technical service representative.

In the Northwest District, two states have been divided and a salesman assigned to each territory. In Iowa, Coy Babb will be Spencer representative in the western half and Don Johnson in the eastern half. In Nebraska, Keith Carter will represent the company in the eastern half and Bill Smith in the western half.

New salesmen are William F. Harris, who will represent Spencer in Mississippi and Louisiana, and John Naylor, who becomes the firm's second salesman in Missouri.

Union Carbide Chemicals Co. Div. of Union Carbide Corp. Four new technical representatives have been appointed to the Crag Agricultural Chemicals staff. They are Richard Baughman, from Zanesville, Ohio; J. Charles Blue, Clifton, Tex.; J. W. Durfee, Amherst, Mass.

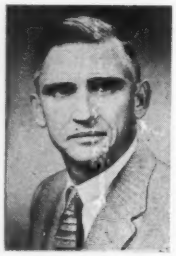
and Daniel J. Leary, Waterbury, Conn.

All will be active in sales of Sevin insecticide dust and Sevin Sprayable.

Virginia-Carolina Chemical Corp. Curtis A. Cox, general manager of fertilizer manufacturing, has been elected a vice president of the firm. Cox has been with V-C 24 years, starting in 1936 as a shipping clerk in Selma, N. C. He has been acid foreman at Rome, Ga.; assistant superintendent at Charleston, S. C.; superintendent at Augusta, Ga.; assistant manager of fertilizer manufacturing, and became general manager last summer.

Cox

Witco Chemical Co. Richard H. Dorsett, formerly with the Organic Chemicals Division's sales force in Dallas, Tex., has been appointed southwestern sales manager, with headquarters in Houston, Tex. The territory includes Texas, Oklahoma, Louisiana, Arkansas and Mississippi.



Dorsett

Robert Stevenson, of the southwestern sales staff, has been transferred from Houston to Dallas.

Chemicals

POLYMERS HAVE POTENTIAL IN PESTICIDES

Two new functional polymers with potential applications in formulation of pesticides have been developed by The Dow Chemical Co.

According to Dow, many organic complexes and several inorganic complexes can be prepared by utilizing the resins which are trademarked Devlex 130 and Devlex A515.

Complexing provides a means of modifying the solubility, volatility, stability, toxicity properties and—in some cases—odor and taste of complexed molecules without altering their chemical nature.

According to Dow, Devlex A515 has potential as a sticker for application of insecticides, fungicides and herbicides because the low water solubility and complexing characteristics minimize wash-off losses.

For details,
CIRCLE 328 ON SERVICE CARD

NEW DIGEST REVIEWS 94 HOOKER CHEMICALS

Ninety-four organic and inorganic chemicals produced by Hooker Chemical Corp. for industry and agriculture are concisely reviewed in a newly revised and enlarged 16-page, quick-reference digest, "Hooker Chemicals," just published by the company.

The new bulletin gives useful information covering 88 commercially produced Hooker chemicals and six development products. Included are more than 20 new or recently developed chemicals.

A thumbnail description, physical data, chemical formula, uses, and types and weights of shipping containers are presented for all 94 chemicals listed.

Copies are available to research, engineering, production, purchasing or other interested executives.
CIRCLE 329 ON SERVICE CARD

USDA CHANGES RESTRICTION ON PARATHION

Growers of cole crops and spinach now can apply parathion insecticide formulations to these crops up to seven days prior to harvest, according to an announcement by Monsanto Chemical Co.

The company reports that USDA has changed its restriction on parathion to provide for two weeks additional application time on cabbage, broccoli, Brussels sprouts, cauliflower, kohlrabi and spinach prior to harvest. Previously, the compound could not be applied later than 21 days before harvesting these crops.

STORING, HANDLING A. N. DESCRIBED IN LEAFLET

The National Plant Food Institute has just released a new leaflet titled "Recommended Storage and Handling of Fertilizer Grade Ammonium Nitrate."

Twelve recommended practices are listed, as well as procedure to be followed if fertilizer grade ammonium is involved in a fire.

Single copies of the bulletin are available without cost on request to the National Plant Food Institute, 1700 K. Street, N. W., Washington 6, D. C. Bulk copies are available at 5 cents each.

NEW USE FOR THIODAN

A new label claim has been granted by USDA permitting use of Thiodan insecticide in curbing walnut aphid, reports Niagara Chemical Div., Food Machinery and Chemical Corp.

Applications of 3–4 pounds of Thiodan 50 wettable powder or 3–4 quarts Thiodan 2 emulsifiable concentrate per acre is specified as the treatment for curbing walnut aphid. The chemical should be applied when aphids first appear, with applications repeated as required up until, but not after, husk-split.

'STABIMIX' E ADDED TO MERCK LINE

'Stabimix' E, a supplemental source of vitamin E, is the second stabilized dry vitamin product added to the Merck Chemical Division line, designed for specific use in poultry and turkey feeds, James E. McCabe, marketing director for agricultural products at Merck, announced recently.

Last fall, Merck introduced the first product in its 'Stabimix' series of vitamins, 'Stabimix' A, which provides supplemental vitamin A.

KENYA PYRETHRUM EXPORTS GROWING

Pyrethrum soon may become one of Kenya's top three exports, along with coffee and tea.

There are now 16,000 African growers and 1,042 European growers, in contrast to only 500 African producers 5 years ago.

Output of dried pyrethrum flowers may reach 9,500 long tons for the year ending June 30, 1961. In the year ended June 30, 1960 production totaled 6,500 tons.

Exportation of dried flowers in bales has been largely replaced by export of liquid extract. The Pyrethrum Board of Kenya has arranged for construction of a second extraction plant. The United States is Kenya's best customer for pyrethrum.

COLUMBIA-SOUTHERN MARKETS POTATO SPROUT INHIBITOR

Columbia-Southern Chemical Corp. has announced marketing of a new type sprout inhibitor containing Chloro IPC, reported to be a permanent, low-cost treatment for potatoes in storage.

Known as Sprout Nip, the product is applied as an aerosol, suspended in the air stream that is circulating through the potatoes stored in bulk or pallet boxes but not stored in burlap bags. Application also can be made directly on the grading table after storage, provided potatoes are thoroughly healed with thick skins and handled gently following treatment.

Columbia-Southern reported the product would be commercially available for the Fall potato harvest, marketed as a service by trained applicators.

Equipment Supplies

SPRAYER ON UTILITY VEHICLE USED IN CITY

A unique method for killing mosquitoes and other harmful insects now is in use in several cities, reports Cushman Motor Works.

The spraying equipment, a John Bean sprayer which weighs about 250 lb. empty and 650 lb. when the spray tank is filled, is mounted on skids and slid onto the steel pick-up box of a Cushman 780 Truckster. As shown in photo, the method is intended primarily for catch basin spraying and one man can operate both Truckster and sprayer.

SPREADER TRUCKS NOW MADE BY GENERAL METALS, INC.

General Metals, Inc., of Greensboro, N. C., now is manufacturing a line of bulk truck spreaders for the fertilizer industry.

According to an announcement just released by Charles G. Monnett, sales manager of General Metals, the trucks are being manufactured under a licensing agreement with the Even Spread Co. of Owensville, O. Power Spreaders made by General Metals will be identical to those made at Owensville.

Material is spread by use of distributor tubes which are said to give even, accurate spreading of the material over the entire area covered. The tubes can be connected or taken off by one person.

The spreader has a chain and slot conveyor in the bottom of the

body, which is driven by the power take-off through a transmission, speed reducer and roller chain.

Complete information is available by

CIRCLING 330 ON SERVICE CARD

FLEXI-DRUMS COLLAPSE TO 12 INCHES

Its new "Flexi-Drum" collapsible container will revolutionize shipping of dry and liquid bulk containers, according to Highway Trailer Industries. The 800-gallon container, above right, collapses like an accordion into 12-inch high self-storing unit at left.

Highway says that one unique feature is the use of thin, disposable plastic inner liners to eliminate need of cleaning, make the same container usable for different products without danger of contamination.

Three standard sizes are offered: 35 cu. ft. (250 gal.); 70 cu. ft. (500 gal.) and 105 cu. ft. (800 gal.). All sizes have 47 inch diameter, collapse to 12 inches high. Tare weight ranges from 106 to 102 lbs; height ranges from 40 inches to 98 inches.

For complete information,

CIRCLE 331 ON SERVICE CARD

ELECTRIC WALKIE TRUCKS FOR NARROW AISLES

A new bulletin issued by The Raymond Corp. illustrates and describes the company's line of electric walkie trucks designed for narrow-aisle operations.

The Model C tractor can be powered either by four 6-volt "golf cart" batteries or two 12-volt industrial batteries. A dual voltage electrical system allows speed and power to be regulated by using either a 12 or 24 volt circuit.

All controls—forward, reverse, speed, lifting and lowering—are situated in the handle. Get a copy of the bulletin by

CIRCLING 332 ON SERVICE CARD

SEMI-BULK HANDLING CONTAINER

Invert-A-Bin shipping and storage containers for handling flowable dry products in many industries are described in a new folder from Powell Pressed Steel Co.

Fabricated of steel or aluminum, the container holds up to 4,000 pounds, seals hermetically to safely handle toxic and hygroscopic materials. Sizes: 36-, 65-, and 88-cu. ft. To obtain the folder,

CIRCLE 333 ON SERVICE CARD

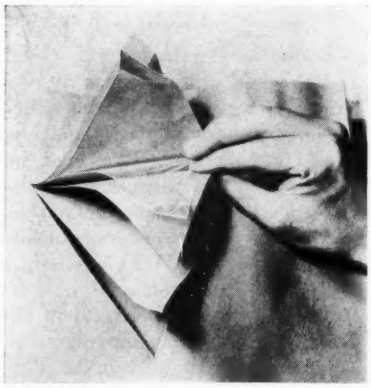
Suppliers Briefs

Bemis Bro. Bag Co. has appointed Donald E. Prim of Detroit as a field sales supervisor. Prim will be responsible for sales in Michigan and northwestern Ohio, and will continue to be headquartered in Detroit. Prim joined Bemis in 1948, and has served as a multiwall bag factory representative and sales representative.

Black Products Co. has announced addition of sales and engineering personnel in the southern and western territories, in line with their expansion plans for valve bag packing equipment.

George H. Garrett becomes southern district manager with headquarters in Irving, Tex., and Harry N. Bullard is named western district manager. He will locate in Inglewood, Calif.

Chase Bag Co. has introduced a new line of moisture-resistant multiwall shipping sacks with polyethylene-and-paper construction. Named the Poly-Ply Multiwall, the bags feature a multiwall structure that includes a separate, intermediate ply (not a liner) of lightweight sheet polyethylene, spot-pasted at top and bottom to adjacent layers of heavy-duty kraft paper. As a result, the polyethylene film is not next to the product. It



Poly-Ply construction is revealed in cutaway of bag wall. Free ply of light-weight sheet polyethylene is shielded by heavy-duty kraft paper inside and out.

is protected from abrasion and other mechanical injuries from the bag contents as well as from the outside.

Bender

Chase has promoted John J. Bender to manager of its Paper Bag Div. plant at Crossett, Ark. A graduate of Dartmouth College, Bender joined Chase in 1951.

Raymond Div. of Combustion Engineering, after having been located for nearly half-a-century in the Chicago Goose Island Industrial District, moved its offices in August to a more central location within Chicago's Loop Area. Home office is in the John Plain Building at 427 West Randolph St., Chicago 6, Ill. Telephone number: CEntral 6-4044.

Vulcan-Associated Container Companies. Appointment of John H. Jones as advertising manager has been announced by Gordon D. Zuck, president. Jones, a graduate of the University of North Carolina with a degree in advertising and journalism, has been engaged in advertising and public relations in the southeast and midwest for the past 10 years. He will maintain his headquarters at the company's executive offices in Birmingham.

Jones

George S. McTavey has been named sales manager of Atlantic-Vulcan Steel Containers, Mr. Zuck said. McTavey had been with Nafton, Inc. Atlantic-Vulcan is one of the plants of Vulcan-Associated.

West Virginia Pulp and Paper Co. J. Frank Greeley has been named Western District sales manager for the Multiwall Bag Div. Frank Greeley will make his headquarters at the company's Torrance, Calif. plant. He succeeds Frank L. Smith who resigned to accept a position with a firm in a different field.

Greeley

PEST REPORTS

FC

*By Kelvin Dorward**

GRASSHOPPERS, which during the early part of the season had caused very little damage, were rather noticeable in several states in August. Early in the month, populations were heavy in spots in Taos and Torrance counties, New Mexico, and threatening infestations occurred on 45,000 acres of rangeland and 62,000 acres of cropland in Quay county. Controls were necessary on 3,700 acres in Slope, Golden Valley and McKenzie counties, North Dakota. Grasshoppers also caused damage in localized areas of Minnesota, Wisconsin, Indiana, Ohio, Oklahoma, Arkansas, and Texas.

The ***fall armyworm*** caused serious damage in several states during August. Light to heavy defoliation of Bermuda grass, millet, grain sorghum and lawns was general throughout Georgia. The insect caused serious damage to forage crops, pastures and grain sorghum in the central and southern areas of Alabama. Heavy populations were recorded throughout Louisiana with counts as high as 600 larvae per foot of row of grain sorghum in Tensas parish.

Moderate to heavy infestations of the fall armyworm were found in fence rows of cropland and soil bank land in several central and north central Texas counties. Populations were heavier than usual in areas of northwest Arkansas with the possibility of controls becoming necessary. The insect also damaged crops in areas of Oklahoma, Missouri, North Carolina, Illinois and Arizona.

The average number of first-generation ***European corn borers*** per 100 plants found during a survey in Illinois was 8.80 compared with 4.32 in 1959. In Boone county, Iowa, larvae averaged 8 per 100 corn plants as compared with 7 for the same time in 1959. The second brood was expected to be considerably larger in 1960 than in 1959. Corn plantings in areas of Cass county, North Dakota, showed infestations of or near 100 per cent. The borer was quite heavy on corn in the southeastern, east central and south central areas of South Dakota, but no control had been applied. It was expected that the insect would be heavier in New Jersey than it had been for some time.

The ***pea aphid*** was the heaviest in many years on second cutting alfalfa and alfalfa grown for seed in areas of Yakima and Adams counties, Washington. Populations were becoming very abundant in alfalfa and red clover in southwest Idaho. Treatment was necessary in many fields. Counts of 20,000–30,000 pea aphids per 100 sweeps were recorded in Montrose and Garfield counties, Colorado. In New Castle county, Delaware, the aphid was on the increase with counts of 250–300 per sweep.

Heavy populations of the ***spotted alfalfa aphid*** were occurring over Antelope Valley, Los Angeles county, California, by late August. The insect was also heavy on first year alfalfa stubble in areas of Sacramento county. Populations were building up in areas of Colorado and many alfalfa fields in Chaves and Eddy counties, New Mexico, were heavily infested. Although infestations were low by late August in Yuma county and in most central and southeast Arizona area alfalfa fields, damage during the July buildup was heavy in many sections.

The ***boll weevil,*** which was reported last month as being on the increase, continued that trend during August. Heavy rains, early in the month, upset treatment schedules in North Carolina to such an extent that many cotton fields in the state carried 50–100 per cent square infestations. Populations were on the increase in South Carolina with third-generation weevils being numerous and migration underway in some upper Coastal Plain and lower Piedmont counties. Square infestations in Georgia varied widely with counts up to 99 per cent. In Washington county, Georgia, the square infestation average was 50 per cent.

Boll weevil infestations were increasing in the Tennessee valley and Sand Mountain areas of Alabama by late August. Fields which previously had light populations were carrying 25–50 per cent infestations. Infestations were also building up in rank cotton in southwestern Tennessee counties, in local spots of the Mississippi delta where controls will be necessary into September, and in the Tallulah area of Louisiana controls were necessary in most fields. Populations in Arkansas were such that if heavy rains should occur, boll weevils were expected to become a problem. In Oklahoma, the heaviest infestations, 0–30 per cent, were in the east central and southeast sections. Heavy populations continued in poorly treated fields of the Waco, Texas, area and remained a serious threat in succulent cotton in several sections of the state.

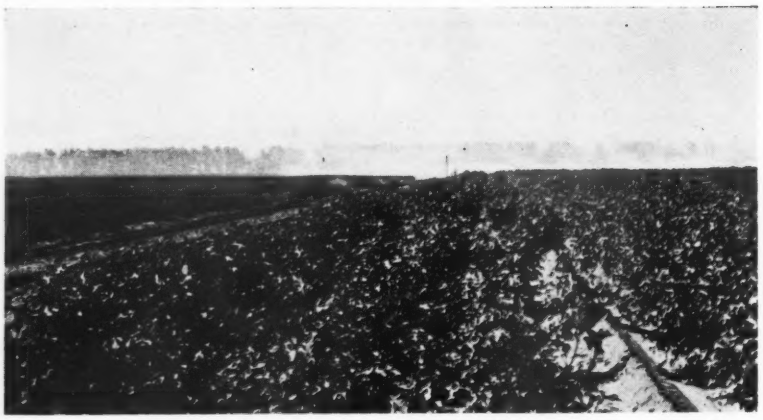
Bollworms were on the increase in most of the cotton-growing states. Damage was reported from Alabama, Tennessee and Oklahoma.

The ***face fly,*** which was reported as an economic livestock pest in this country for the first time last year, continued its westward spread. During August the fly was reported from Nebraska and Minnesota for the first time. Populations were on the increase in Illinois where the fly was the number one livestock pest. Economic populations were present on cattle in many areas of northern Indiana and a horse herd in Walworth county, Wisconsin, was seriously attacked by face flies.

The ***oriental fruit fly,*** one of the most severe insect pests of citrus as well as a number of other hosts, was taken for the first time in the continental United States at Anaheim, California. A single female fly was taken in a trap in a citrus grove in the southeastern section of Anaheim during the week of July 24–29. Positive identification was made August 9. Plans were immediately initiated to intensively trap the area in the vicinity of the find. No further flies were found until August 31, when one male was trapped near Anaheim City Park, which is west of the original find. ▲

* *Chief Staff Officer, Survey & Detection Operations, Plant Pest Control Div., Agricultural Research Service, USDA.*

The Research and Development Dept. of U.S. Rubber Co.'s Naugatuck Chemical Div. at LaMiranda, Calif., reports on an interesting test.



Dust cloud drifts from cotton on right over alfalfa on left.

ARAMITE AERIAL DUST DRIFT AI

AN AIRPLANE-APPLIED Aramite dust drift experiment was conducted in Kern county, California, in August, 1959. The objectives of this experiment were to make preliminary determinations of the extent of the dust drift problem and the disappearance of Aramite on alfalfa hay.

Forty acres of cotton upwind from an alfalfa field were treated with 40 lb. of 3% Aramite dust per acre by a standard Stearman biplane duster. The alfalfa plants averaged 7.5 inches in height at the time of treatment. The dust was applied to the cotton between the hours of 9:55 A.M. and 11:00 A.M. Air temperatures were recorded at several intervals above the surface. These air temperatures indicated that the air was relatively stable during the period of dust treatment.

Wind direction and velocity was measured at a height of 20 feet above the surface. The drift component, for the purpose of this experiment, is defined as that component of the wind which carried dust from the treated area in the cotton to the alfalfa field. The average drift component was found to be 6.03 miles per hour.

Alfalfa samples, to determine the residue of Aramite, were taken within four hours after treatment at intervals of 100, 300, and 600 feet downwind from the cotton. Subsequent alfalfa samples were taken one, two, four, eight, twelve, and sixteen days after treatment to determine the rate of Aramite disappearance. At each sampling interval, one sample was allowed to dry for four days after cutting to determine the residue on alfalfa hay.

The sensitivity of the Aramite analytical method used in this experiment was 0.01 ppm. This degree of sensitivity can only be realized by carefully using precise sampling and analytical methods in the field and laboratory.

The average Aramite deposit on the treated cotton was 10.16 ppm. The average Aramite deposits measured from dust drift on the alfalfa are shown in Table 1 under zero days. The disappearance or degradation of this residue is also shown in Table 1 from the various days of sampling after treatment. These degradation data, after being analyzed statistically, are shown in Figure 1 for green alfalfa and Figure 2 for alfalfa hay. The data indicate that the residue in parts per million is increased approximately two times from weight loss due to drying of the alfalfa when the alfalfa is cut for hay.

TABLE 1.

AVERAGE ARAMITE DEPOSITS IN PPM

	FEET DOWNWIND			
	Hay	Green Alfalfa		
Days	**100**	**100**	**200**	**300**
0	1.34	0.76	0.41	0.42
1	1.65	0.78	—	—
2	1.53	0.76	—	—
4	0.78	0.38	0.20	0.17
8	0.29	0.16	—	—
12	0.22	0.14	—	—
16	0.14	0.07	—	—

One experiment of this type does not provide adequate data for accurate predictions or a basis for firm conclusions. However, the experiment was conducted under severe drift conditions. The aforementioned results and the following discussion are provided to serve only as a guide in the absence of additional experimental evidence. Additional Aramite drift studies are being conducted aimed at providing

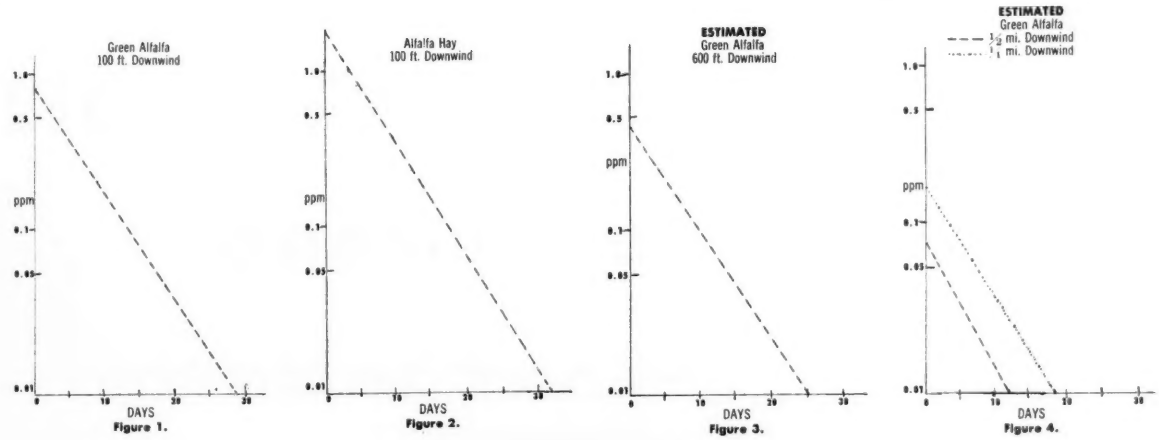


Figure 1. Figure 2. Figure 3. Figure 4.

ARAMITE DEGRADATION CURVES

T AND DEGRADATION EXPERIMENT

on alfalfa hay

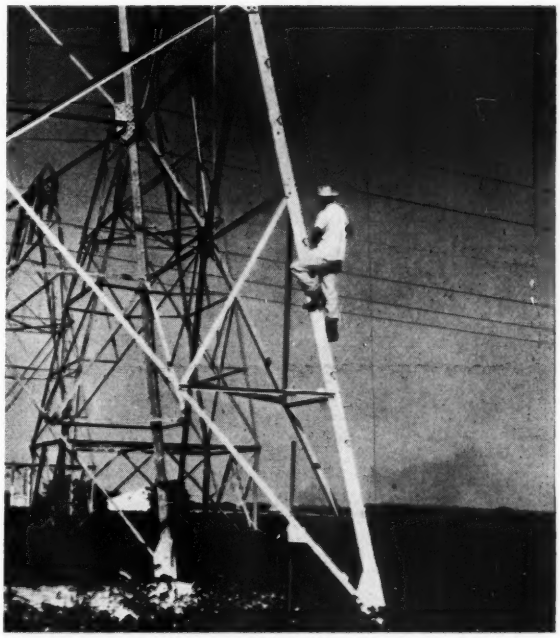
more conclusive information. An effective aerial applied Aramite spray (Aramite-85E) has been developed for cotton and seed alfalfa. These additional drift studies are being conducted with aerial sprays rather than dusts. The recently developed Aramite spray formulation appears to be effective with medium to coarse spray droplet size treatments. Such droplet size ranges would be expected to result in appreciably less downwind drift and deposit than was demonstrated in this dust experiment.

Figures 3 and 4 are *estimates* which may be of assistance in field problems until further experimental evidence is available. The curve in Figure 3 which indicates initial deposit and degradation of Aramite on green alfalfa 600 feet downwind agrees with the data and is probably a reasonable estimate. The two curves at one-half and one-quarter miles downwind which appear in Figure 4 are estimates based *only* on the type of drift curve one might expect as demonstrated by experiments conducted by Akesson and Yates of the University of California.

While this experiment was conducted under extremely severe drift conditions, it must be kept in mind that the results reported here were obtained under relatively stable air conditions with respect to vertical air movement. Dust applications made after heat thermals begin to develop in the hotter part of the day or after low-level inversions develop in the evening (a common occurrence in the Southern San Joaquin Valley), would not be expected to follow a drift pattern similar to that reported herein.

This experiment, plus analytical data from field samples, provided a basis for the following suggestions:

- When cutting alfalfa which has been subjected to a drift deposit, expect to increase the residue in terms of parts per million which exists at the time of cutting, approximately two times as the alfalfa dries to hay.
- Aramite residues apparently disappear at a reasonably rapid rate on green alfalfa. Aramite residues do not disappear at a rapid rate after the alfalfa has been cut and, particularly, after the hay has been baled. In cases where an Aramite drift deposit has been known to occur, the cutting of the alfalfa should be delayed as long as possible.
- Aramite drift deposits on windrows of cut alfalfa or on baled hay, including stacks of bales, would be expected to disappear at a relatively slow rate.



Naugatuck's J. P. Corkins is shown on the tower which houses meteorological instruments used in the experiment.

CONSUMPTION

of Commercial

FERTILIZERS

and Primary

PLANT NUTRIENTS

in the United States, year ended June 30, 1959

By WALTER SCHOLL

MARION M. DAVIS and

CAROLINE A. WILKER*

TABLE 1. KINDS OF FERTILIZERS CONSUMED, year ended June 30, 1959[1]

Tons

Kind	New England	Middle Atlantic	South Atlantic	East North Central	West North Central	East South Central	West South Central	Mountain	Pacific	Hawaii and Puerto Rico	United States
MIXTURES	373,619	1,815,887	5,169,196	3,638,495	1,552,604	2,078,694	691,116	73,524	412,144	278,634	16,069,027
N-P-K	349,058	1,703,292	4,703,908	3,349,324	1,301,192	1,864,892	616,748	38,323	309,362	247,175	14,483,274
N-P	54	648	1,207	64,527	172,463	9,896	35,399	35,120	97,782	1,024	418,130
P-K	24,497	111,936	209,953	218,424	79,884	198,768	37,545	58	2,462	5,895	888,322
N-K	0	111	245,128	220	69	5,048	1,424	23	2,538	24,540	279,301
CHEMICAL NITROGEN MATERIALS	11,738	78,824	880,161	491,407	687,135	581,105	473,426	252,838	951,998	81,820	4,493,804
Ammonia, anhydrous	0	3,003	28,472	67,883	168,549	60,531	145,854	45,515	140,460	784	681,073
Ammonia, aqua	0	2	0	11,497	14,427	4,939	6,794	29,862	366,185	49,112	482,818
Ammonium nitrate[2]	5,167	34,722	156,025	161,835	131,880	290,662	121,901	76,460	94,143	0	1,072,797
Ammonium nitrate-limestone mixtures	58	1,385	263,135	455	30	38,216	2,543	214	315	0	306,351
Ammonium sulfate	440	7,093	8,420	113,517	9,598	13,911	82,154	59,053	227,763	27,994	549,945
Calcium cyanamide	651	6,977	9,373	812	0	7,130	7,796	606	7,317	0	40,838
Calcium nitrate	12	3	11,508	140	0	1,178	446	8,183	30,854	102	52,426
Nitrogen solutions	1,483	6,006	138,085	94,343	156,530	14,739	24,779	13,525	54,950	0	504,440
Sodium nitrate	1,717	11,648	260,438	1,197	594	146,143	37,201	302	213	121	479,374
Urea	1,580	4,966	2,868	17,998	4,967	3,543	23,180	17,606	27,748	5,700	110,176
Other	630	2,419	1,837	1,730	780	111	580	1,434	1,978	7	13,566
NATURAL ORGANIC MATERIALS	25,017	40,938	31,083	51,708	19,286	2,838	6,855	5,915	134,145	153	317,948
Blood, dried	15	115	20	0	0	0	0	45	2,316	0	2,511
Castor pomace	1,578	135	4,181	0	0	0	0	0	2,023	0	7,917
Compost[3]	166	1,052	562	7,669	8,421	186	1,626	86	37	0	19,805
Cottonseed meal[3]	2,371	84	2,180	0	0	27	0	0	96	0	4,758
Fish scrap, meal, emulsions	315	28	6	0	0	0	0	94	1,271	0	1,714
Manures, dried	8,715	16,466	6,264	9,061	3,725	1,267	3,321	1,863	271,148	1	321,851
Sewage sludge, activated	8,050	14,670	8,680	14,298	7,130	1,319	1,897	3,131	17,044	130	96,329
Sewage sludge, other	0	0	139	124	0	6	0	36	33,564	0	33,869
Tankage, all	3,068	8,178	5,450	616	10	23	0	62	1,440	2	18,849
Other	739	210	3,601	0	0	11	578	5,298	0	0	10,345
PHOSPHATE MATERIALS	28,937	84,234	104,365	699,408	631,810	246,584	215,130	195,888	270,116	17,085	2,513,757
Ammonium phosphate: 11-48[4]	0	1,386	35	14,218	55,268	0	4,770	10,685	15,751	1,405	103,518
Ammonium phosphate: 13-39[5]	0	0	0	370	24,451	11	16,636	4,496	6,026	0	52,010
Ammonium phosphate sulfate: 16-20[6]	0	0	0	294	95,371	595	83,665	57,134	98,645	395	336,759
Ammonium phosphate nitrate: 27-14[7]	0	0	0	0	3,081	9	4	3,783	13,457	0	20,334
Basic slag	0	0	20,213	30	0	116,743	2,382	0	0	0	139,368
Bonemeal: raw and steamed	1,484	3,819	1,700	1,619	261	411	196	38	2,165	0	11,693
Calcium metaphosphate	0	525	2,700	1,687	20,585	14,764	320	202	31	0	44,814
Diammonium phosphate: 21-53[8]	10	210	634	4,176	5,737	2,582	1,028	9,280	1,909	1,414	26,980
Phosphoric acid	0	0	0	0	181	0	2,260	9,434	11,321	0	23,205
Phosphate rock	382	6,611	14,651	547,455	235,227	11,041	18,443	215	1,529	4,147	819,681
Colloidal phosphate	0	210	4,384	1,351	3,067	7,215	1,350	0	390	0	17,987
Superphosphate: 18%	815	7,823	21,454	12,308	16,077	19,195	1,350	101	1,125	0	80,248
" 19%	4,384	0	4,142	463	35	52,001	9	2,295	62,908	5,428	131,665
" 20-22%	21,441	61,798	27,947	41,723	29,961	16,257	60,218	13,414	25,004	0	297,359
" 23-41%	0	0	0	2,838	707	0	449	1,227	69	856	6,146
" 42-44%	0	0	0	110	12,040	0	0	25,689	6,129	0	43,974
" 45%	2	753	56	21,772	30,158	980	9,089	47,390	21,308	0	151,508
" 46%	359	1,102	996	61,249	73,454	3,887	32,055	10,106	237	3,100	186,545
" 47-48%	0	3	4,383	4,952	3,629	778	741	17	0	0	14,503
" 49-54%	8	0	25	28	312	295	73	122	27	0	890
Other	72	0	1,045	765	0	61	0	0	2,085	240	4,270
POTASH MATERIALS	2,671	9,240	50,217	206,660	51,259	64,019	19,081	2,826	15,235	13,024	494,932
Cotton hull ashes	436	24	0	0	8	0	0	0	0	0	488
Lime-potash mixtures[2]	0	0	21,371	1	0	7,775	0	0	0	0	29,147
Manure salts	0	0	388	0	0	0	55	0	0	0	443
Potassium chloride: 50%	0	0	543	1,174	0	600	1,547	62	0	0	4,326
" 60%	1,971	6,275	40,086	200,140	50,504	47,437	35,240	1,474	7,030	11,198	401,255
" magnesium sulfate	89	1,210	2,859	2,078	387	1,281	1,347	1,136	1,763	9	11,759
" nitrate	106	0	101	2	0	0	0	0	2	0	231
" sodium nitrate[2]	0	0	19,077	0	0	672	154	0	2	10	19,915
" sulfate	128	1,659	4,648	3,131	225	6,271	7	1,136	6,428	1,807	25,640
Other	1	72	1,143	125	15	1	327	0	10	0	1,728
SECONDARY AND TRACE NUTRIENT MATERIALS	97	5,290	121,750	3,132	686	5,017	1,904	30,315	1,049,101	2,982	1,223,204
Aluminum sulfate[3]	0	12	7	0	0	0	0	4	16	0	39
Borax[3]	35	221	340	296	96	445	18	0	501	0	1,972
Calcium sulfate (gypsum)	13	5,016	118,947	1,604	398	4,329	997	22,572	1,006,789	0	1,160,667
Copper sulfate[3]	0	60	198	36	1	1	0	138	78	0	506
Iron sulfate[3]	0	0	102	2	23	38	7	484	1,765	2,843	5,263
Magnesium sulfate[3]	24	237	106	48	7	58	1	47	47	52	627
Manganese sulfate[3]	9	174	44	729	8	0	0	47	40	0	1,042
Mixed minerals[3]	1	12	1,158	95	99	48	62	1,408	6,025	0	8,869
Sulfur: 25-99% S	8	47	592	90	21	4	1,289	1,955	21,208	2	25,210
Sulfuric acid: 50-93%	0	0	0	0	0	8	1,459	2,843	1,311	0	5,053
Zinc sulfate[3]	6	13	365	33	33	134	1	40	1,303	85	2,089
Other	20	198	0	138	0	0	30	1,383	7,998	0	10,067
GRAND TOTAL	442,079	2,034,513	6,387,784	5,087,030	2,943,904	2,978,177	1,449,912	561,306	3,032,669	395,698	25,312,672

1/ Includes: in mixtures; 108 tons of 11-33-0 grade, 172 tons of 14-14-14 grade, 3,838 tons of 30-10-0 grade, in materials; 4,231 tons of calcium metaphosphate, 618 tons of superphosphate (54%), 3,789 tons of diammonium phosphate, and 2 tons of nitrogen solution (30%) distributed by Government agencies for test demonstrations. Does not include liming materials or the quantities of materials used for the manufacture of the indicated quantities of commercial mixtures. 2/ Undetermined quantities may have been used for non-fertilizer purposes. 3/ Distributed by manufacturers of fertilizers. 4/ Includes all reported quantities of grade. 5/ Additional quantities are given free to farmers for which no records are kept. 6/ Additional quantities may have been reported by grade under mixtures.

Table 1, footnote 1 should read—

[1] Includes the following fertilizers distributed by government agencies for test demonstrations. In mixtures, 11–30–0 grade 108 tons, 14–14–14 grade 172 tons, 30–10–0 grade 3,838 tons; in materials, calcium metaphosphate 4,231 tons, superphosphate (54 %) 618 tons, diammonium phosphate 3,789 tons, and nitrogen solution (30 %) 2 tons. Excludes liming materials or the quantities of materials used for the manufacture of the indicated quantities of commercial mixtures.

CONSUMPTION of fertilizers and primary plant nutrients (N, P_2O_5, K_2O) are reported for individual States including Hawaii, the District of Columbia, and Puerto Rico, for the year ended June 30, 1959. Only incomplete data were available for Alaska and the Virgin Islands for this period and are not included in the quantities cited in this report. However, fertilizers known to have entered Alaska and the Virgin Islands in 1958 totaled 2,838 tons and 888 tons, respectively. Presumably these tonnages approximate all commercial fertilizer consumed in these areas.

Information was obtained from (1) manufacturers on the tonnage of each kind and grade of product shipped to agents, dealers, and consumers, (2) distributors and custom applicators of anhydrous ammonia and nitrogen solutions, (3) fertilizer brok-

Fertilizer Investigations Research Branch, Soil and Water Conservation Research Division, Agricultural Research Service, U. S. Department of Agriculture, Beltsville, Maryland.

TABLE 2. CHANGE IN FERTILIZER CONSUMPTION in regions and United States, year ended June 30, 1959

Region	Increase or decrease (—) from year ended June 30, 1958					
	Mixtures Tons	Materials[1] Tons	Total[1] Tons	Mixtures Per cent	Materials[1] Per cent	Total[1] Per cent
New England	6,741	—2,287	4,454	1.8	—3.2	1.0
Middle Atlantic	87,718	12,963	100,681	5.1	6.5	5.2
South Atlantic	544,277	154,894	699,171	11.8	16.3	12.6
East North Central	306,601	101,635	408,236	9.2	7.5	8.7
West North Central	349,863	281,351	631,214	29.1	25.4	27.3
East South Central	283,064	67,866	350,930	15.8	8.3	13.4
West South Central	59,889	49,775	109,664	9.5	7.1	8.2
Mountain	4,374	22,277	26,651	6.3	5.1	5.3
Pacific	36,526	107,572	144,098	9.7	7.4	7.8
Total	1,679,053	796,046	2,475,099	11.9	11.2	11.7
Hawaii	—5,710	20,895	15,185	—9.5	35.0	12.7
Puerto Rico	42,661	—19,512	23,149	23.5	—36.9	9.9
United States	**1,716,004**	**797,429**	**2,513,433**	**12.0**	**11.0**	**11.7**

[1] Excludes quantities of secondary and trace nutrient materials for direct-application.

TABLE 3. FERTILIZERS CONSUMED AS MIXTURES AND AS DIRECT-APPLICATION MATERIALS, year ended June 30, 1959, compared with consumption of previous year

State and region	Mixtures			Materials[1]			Grand total	Comparison with total consumption in year ended June 30, 1958	
	July 1 - Dec. 31, 1958	Jan. 1 - June 30, 1959	Total	July 1 - Dec. 31, 1958	Jan. 1 - June 30, 1959	Total		Fertilizer[2]	N, avail. P_2O_5, & K_2O
	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Percent	Percent
Maine	22,415	148,923	171,338	1,724	6,964	8,688	180,026	101	100
New Hampshire	3,342	13,185	16,527	1,438	2,969	4,407	20,934	104	104
Vermont	5,471	32,688	38,159	11,851	5,120	16,971	55,130	96	96
Massachusetts	12,794	58,421	71,215	5,115	13,997	19,112	90,327	104	103
Rhode Island	2,130	12,818	14,948	378	1,454	1,832	16,780	97	97
Connecticut	9,745	51,687	61,432	5,000	12,450	17,450	78,882	103	105
New England	55,897	317,722	373,619	25,506	42,954	68,460	442,079	101	101
New York	117,226	426,000	543,226	25,233	54,765	79,998	623,224	98	100
New Jersey	45,201	184,219	229,420	7,869	18,160	26,029	255,449	118	118
Pennsylvania	165,331	426,656	591,987	21,889	52,167	74,056	666,043	104	105
Delaware	15,947	75,422	91,369	917	3,727	4,644	96,013	116	117
District of Columbia	1,193	2,617	3,810	403	693	1,096	4,906	122	129
Maryland	66,719	223,687	290,406	6,641	15,423	22,064	312,470	112	116
West Virginia	12,684	52,985	65,669	1,206	7,533	10,739	76,408	104	104
Middle Atlantic	424,301	1,391,586	1,815,887	66,158	152,468	218,626	2,034,513	105	107
Virginia	146,408	538,510	684,918	19,180	92,011	111,191	796,109	113	114
North Carolina	187,916	1,185,272	1,373,188	57,418	323,699	381,117	1,754,305	116	117
South Carolina	96,224	543,842	640,066	38,218	216,874	255,092	895,158	122	124
Georgia	253,348	916,156	1,169,504	52,704	255,296	308,000	1,477,504	117	120
Florida	495,505	797,015	1,292,520	64,719	107,469	172,188	1,464,708	100	101
South Atlantic	1,179,401	3,980,795	5,160,196	232,239	995,349	1,227,588	6,387,784	113	114
Ohio	255,850	721,466	977,316	32,885	88,589	121,474	1,098,790	104	107
Indiana	248,307	673,709	922,016	59,397	196,708	256,105	1,178,121	109	112
Illinois	158,147	502,768	660,915	434,458	501,366	935,824	1,596,739	110	119
Michigan	203,140	448,392	651,532	21,329	62,667	83,996	735,528	113	114
Wisconsin	81,714	339,002	420,716	15,385	41,751	57,136	477,852	108	110
East North Central	947,158	2,685,337	3,632,495	563,454	891,081	1,454,535	5,087,030	109	113
Minnesota	84,884	310,365	395,249	43,573	109,695	153,268	548,517	124	123
Iowa	84,237	350,398	434,635	86,776	174,108	260,884	695,519	128	132
Missouri	177,531	353,419	530,950	192,549	209,703	402,252	933,202	123	130
North Dakota	8,407	31,118	39,525	22,144	70,165	92,309	131,834	124	124
South Dakota	1,941	9,328	11,269	5,439	22,005	27,444	38,713	113	110
Nebraska	7,292	39,069	46,361	46,293	212,408	258,701	305,062	131	129
Kansas	56,116	38,503	94,619	97,851	98,187	196,038	290,657	147	144
West North Central	420,408	1,132,200	1,552,608	494,625	896,271	1,390,896	2,943,504	127	129
Kentucky	70,911	414,932	485,843	28,096	82,300	110,396	596,239	112	114
Tennessee	89,528	387,233	476,761	35,747	88,693	124,440	601,201	117	120
Alabama	146,967	655,115	802,082	62,626	214,711	277,337	1,079,419	114	106
Mississippi	23,764	290,154	313,918	135,271	252,129	387,400	701,318	111	111
East South Central	331,170	1,747,434	2,078,604	261,740	637,833	899,573	2,978,177	113	113
Arkansas	21,387	147,167	168,554	42,913	148,116	191,029	359,583	124	126
Louisiana	32,850	127,114	159,964	34,770	96,296	131,066	291,030	105	104
Oklahoma	31,111	40,133	71,244	37,344	25,335	62,679	133,923	125	134
Texas	85,604	205,950	291,554	137,517	236,305	373,822	665,376	100	104
West South Central	170,952	520,364	691,316	252,544	506,052	758,596	1,449,912	108	111
Montana	1,185	1,974	3,159	16,639	21,438	38,077	41,236	108	109
Idaho	2,752	10,822	13,574	37,802	83,476	121,278	134,852	125	123
Wyoming	54	1,424	1,478	3,336	11,117	14,453	15,931	121	118
Colorado	1,836	12,360	14,196	21,904	52,958	74,862	89,058	109	109
New Mexico	752	2,069	2,821	6,485	31,805	38,290	41,111	102	100
Arizona	11,516	17,720	29,236	67,884	98,859	166,743	195,979	95	100
Utah	1,413	5,330	6,743	8,203	22,307	30,510	37,253	93	91
Nevada	515	1,802	2,317	1,109	2,460	3,569	5,886	95	96
Mountain	20,023	53,501	73,524	163,362	324,420	487,782	561,306	105	106
Washington	7,169	39,206	46,375	68,506	128,196	196,702	243,077	98	99
Oregon	6,876	24,220	31,096	44,903	124,330	169,233	200,329	106	107
California	114,928	219,745	334,673	1,046,806	1,207,784	2,254,590	2,589,263	110	111
Pacific	128,973	283,171	412,144	1,160,215	1,460,310	2,620,525	3,032,669	108	108
Total	3,678,283	12,112,110	15,790,393	3,219,843	5,906,738	9,126,581	24,916,974	112	114
Hawaii	25,174	29,323	54,497	41,861	41,771	83,632	138,129	113	114
Puerto Rico	91,223	132,914	224,137	14,960	18,472	33,432	257,569	110	113
United States 1958-59	3,794,680	12,274,347	16,069,027	3,276,664	5,966,981	9,243,645	25,312,672	112	114
1957-58	3,420,837	10,932,186	14,353,023	2,994,676	5,168,064	8,162,740	22,515,763	100	100
1956-57	3,704,380	10,998,427	14,702,807	2,875,726	5,130,478	8,006,204	22,709,011	101	98

1/ Quantities include the primary nutrient (N, P_2O_5, K_2O) materials and the secondary and trace nutrient materials. 2/ Fertilizers which were guaranteed to contain one or more of the primary nutrients.

ers, and (4) tonnage reports issued by the respective States. Data for California, Florida, Massachusetts, Missouri, North Carolina, South Carolina, Texas, and Virginia, however, were obtained chiefly from the State tonnage reports.

The tonnages of fertilizer reported as mixtures and materials include all forms (bagged, blends, bulk, custom mix, granular, liquid, pesticide mixes, pulverized) marketed by the respondents indicated above. The tonnages of bulk blends marketed by dealers and applicators are not included as such. But the quantities of products (mixtures and materials) used for blending by dealers and applicators are included in the reports of respondents who supplied the products.

The quantities of N, P_2O_5, and K_2O are based on the average analyses of samples of the products as reported by fertilizer-control officials of the respective State in which they were marketed, rather than on the manufacturers' guarantees. Thus, the overruns or underruns of nutrients are taken into account.

Quantities are reported as 2,000-pound tons. Although the data refer to shipments, the terms "consumption," "sales," and "shipments" are used synonymously. Actual consumption undoubtedly differs slightly from either shipments or sales.

ALL FERTILIZERS

The total quantity of fertilizer consumed in the year ended June 30, 1959, was 25,312,672 tons (table 1). It comprised 24,089,468 tons of products containing one or more of the primary nutrients and 1,223,204 tons of secondary and trace nutrient materials. Consumption of fertilizers containing primary nutrients was 2,513,433 tons (11.7 per cent) more than (21,576,035 tons) in 1957–58. The quantity of the secondary and trace nutrient materials was 283,476 tons (30.2 per cent) more than the 939,728 tons used in the preceding year.

Changes in the consumption of primary-

TABLE 4. PRINCIPAL GRADES OF MIXTURES CONSUMED, in the U. S., year ended June 30, 1959, compared with consumption of previous year

Grade	Consumption[1]		Proportion of total		Grade	Consumption[1]		Proportion of total	
	1958	1959	1958	1959		1958	1959	1958	1959
	Tons	Tons	Percent	Percent		Tons	Tons	Percent	Percent
0-9-27	12,853	13,689	0.09	0.09	6-8-6	115,721	105,287	.82	.67
0-10-20	76,963	90,580	.54	.58	6-8-8	239,274	252,026	1.69	1.60
0-10-30	51,339	53,515	.33	.33	6-8-12	14,516	20,870	.11	.13
0-12-12	11,431	13,640	.08	.09	6-9-12	21,908	11,581	.15	.07
0-12-36	13,557	13,762	.09	.09	6-10-4	76,780	103,127	.55	.65
0-14-14	186,776	200,918	1.33	1.27	6-12-6	35,630	61,793	.25	.40
0-15-30	24,228	30,256	.17	.19	6-12-12	389,039	482,902	2.76	3.05
0-15-45	8,914	12,157	.06	.08	6-12-18	9,855	10,955	.07	.07
0-16-8	9,207	13,073	.06	.08	6-18-6	25,361	37,889	.18	.24
0-20-10	8,642	10,975	.06	.07	6-24-12	144,589	224,460	1.03	1.42
0-20-20	285,711	281,857	2.02	1.79	6-24-24	107,939	172,492	.76	1.10
0-24-24	10,764	15,438	.08	.09	7-7-7	19,617	17,629	.14	.11
0-25-25	30,247	37,877	.21	.24	7-28-14	26,933	47,309	.20	.30
0-30-15	10,835	13,510	.08	.09	8-0-8	12,017	15,459	.08	.10
0-30-30	14,440	13,488	.10	.08	8-0-24	20,463	25,385	.15	.16
2-12-12	302,441	302,501	2.15	1.92	8-4-8	53,300	56,511	.37	.35
3-9-6	48,138	37,654	.34	.24	8-4-10	6,737	11,001	.04	.07
3-9-9	500,107	466,021	3.54	2.95	8-8-8	205,192	217,294	1.46	1.38
3-9-12	28,229	49,747	.20	.32	8-12-12	68,877	76,165	.48	.48
3-9-13	3,570	16,426	.03	.10	8-16-16	191,186	200,023	1.36	1.27
3-9-18	63,982	84,886	.45	.54	8-24-0	21,890	26,665	.15	.17
3-9-27	67,528	61,732	.48	.39	8-24-8	45,615	56,837	.33	.36
3-11-11	7,804	12,791	.06	.08	8-24-12	23,877	36,617	.17	.23
3-12-6	89,117	71,452	.63	.45	8-32-0	52,210	61,897	.37	.39
3-12-12	708,604	626,227	5.03	3.97	8-32-16	9,542	19,864	.07	.13
3-18-9	29,246	19,550	.20	.12	9-6-6	13,892	13,317	.09	.08
3-18-18	14,551	18,124	.11	.12	9-9-9	33,634	35,875	.24	.23
4-6-8	28,720	29,859	.20	.18	9-12-12	13,870	17,278	.10	.11
4-7-5	114,495	92,709	.81	.59	9-36-0	9,526	10,175	.07	.06
4-8-4	14,698	16,328	.11	.07	10-0-10	17,547	17,714	.12	.12
4-8-6	82,839	62,804	.59	.40	10-2-10	9,319	13,353	.07	.08
4-8-8	137,019	96,380	.97	.61	10-5-5	7,615	11,502	.05	.07
4-8-10	84,934	83,634	.60	.53	10-6-4	78,079	91,320	.56	.58
4-8-12	113,281	155,926	.80	.99	10-10-5	23,061	22,542	.16	.14
4-9-3	49,950	59,968	.36	.38	10-10-10	701,970	747,746	4.98	4.74
4-10-6	86,319	120,548	.61	.76	10-20-0	47,466	47,847	.33	.30
4-10-7	306,541	305,838	2.17	1.94	10-20-5	11,912	15,751	.09	.10
4-10-10	21,440	22,838	.15	.14	10-20-10	165,234	218,214	1.17	1.39
4-11-11	7,531	10,908	.05	.07	10-20-20	45,248	56,902	.32	.36
4-12-4	41,225	33,262	.29	.21	12-0-12	16,385	13,505	.11	.09
4-12-8	123,724	112,909	.88	.72	12-0-12	11,219	15,884	.08	.10
4-12-12	1,021,630	1,240,135	7.24	7.85	12-6-6	23,024	29,395	.17	.19
4-16-8	26,168	28,554	.19	.18	12-12-12	690,322	900,038	4.89	5.70
4-16-16	469,477	448,563	3.32	2.84	12-24-12	31,862	36,595	.22	.23
5-6-8	12,472	11,048	.09	.07	13-13-13	47,658	51,419	.34	.32
5-7-5	19,751	16,466	.14	.11	14-0-14	53,046	66,071	.37	.42
5-10-5	535,745	449,700	3.80	2.85	14-14-14	43,390	50,762	.31	.32
5-10-10	1,479,466	1,642,700	10.48	10.40	15-0-15	11,492	18,622	.08	.12
5-10-15	206,112	345,094	1.46	2.18	15-5-5	12,786	13,480	.09	.09
5-10-30	10,080	15,087	.07	.10	15-10-10	12,089	41,531	.09	.26
5-12-10	8,196	12,958	.06	.08	15-15-0	20,709	25,339	.14	.16
5-20-10	85,592	112,603	.60	.72	15-15-15	29,953	36,055	.22	.23
5-20-20	818,501	983,847	5.81	6.23	16-8-8	10,981	39,526	.07	.25
6-4-6	17,922	28,202	.12	.15	16-48-0	19,571	28,824	.14	.18
6-4-8	54,872	64,062	.39	.40	17-7-0	14,541	12,583	.11	.08
6-6-6	92,844	89,854	.66	.57	20-0-20	10,275	15,124	.07	.10
6-6-8	37,136	32,792	.26	.21	24-20-0	8,062	12,237	.06	.08
6-6-12	21,233	30,197	.15	.19	30-10-0	1,259	10,620	.01	.06
6-6-18	13,443	14,210	.10	.09					
Grades of 10,000 tons or more						[2]/12,911,855	[3]/14,470,486	91.50	91.64
Grades of 5,000 to 9,999 tons						[4]/ 409,442	[5]/ 350,461	2.90	2.22
Grades of 2,500 to 4,999 tons						[6]/ 215,938	[7]/ 242,264	1.53	1.53
Grades under 2,500 tons						[8]/ 204,304	[9]/ 350,504	1.44	2.22
Not reported by grade						369,801	376,678	2.63	2.39
Total[10]						[11]/14,111,340	[12]/15,790,393	100.00	100.00

1/ Grades consumed in amounts of 10,000 tons or more in year ended June 30, 1959 and their consumption in year ended June 30, 1958. 2/ 108 grades. 3/ 118 grades. 4/ 56 grades. 5/ 46 grades. 6/ 62 grades. 7/ 67 grades. 8/ 1,359 grades. 9/ 1,380 grades. 10/ Does not include the quantity of mixtures consumed in Hawaii or Puerto Rico. 11/ 1,585 grades. 12/ 1,611 grades.

nutrient fertilizers between 1957–58 and 1958–59 are summarized, by regions, in table 2. The increase in total consumption in 1958–59 was due to substantial increases in both mixtures (1,716,004 tons, 12.0 per cent) and in direct-application materials (797,429 tons, 11.0 per cent). Consumption of both classes of fertilizers increased in most regions. However, the total increased use in the West North Central, East South Central and South Atlantic regions and in Hawaii each exceeded the national increase of 11.7 per cent.

Although the national increase in consumption of primary-nutrient fertilizers was substantially higher than for any previous year, as shown in table 3 (column 9), decreases or no change occurred in nine of the 51 areas indicated. In comparison with 1957–58, increases were as high as 47 per cent (Kansas), whereas the maximum decrease was seven per cent (Utah). In the areas showing increases 2,545,403 tons (12.9 per cent) more fertilizer was consumed, whereas in the areas showing decreases consumption declined 31,970 tons (1.7 per cent)—resulting in a net increase of 2,513,433 tons (11.7 per cent).

Compared with 1957–58, the consumption of mixtures in 1958–59 increased by 373,843 tons (10.9 per cent) in the July-December period and by 1,342,161 tons (12.3 per cent) in the January-June period. Consumption of primary-nutrient materials for direct application also was higher by 123,497 tons (4.9 per cent) and 673,932 tons (14.4 per cent) in these periods, respectively. The percentage increase of mixtures was nearly the same for each six-month period whereas that of materials was almost three times as high in January-June as in the July-December period.

MIXTURES

In 1958–59 mixtures comprised 63.5 per cent of the total tonnage of fertilizers consumed and amounted to 16,069,027 tons—an increase of 1,716,004 tons (12.0 per cent) from 14,353,023 tons in the preceding year. This is the first year since 1952–53 that mixtures have shown a tonnage increase and the 1958–59 total establishes a new peak in consumption. There were 1,726 grades reported. In addition over 500 grades, not reported by grade but many of which undoubtedly were duplicated in the above total, were used in California. An unknown number for which the grade was not shown were also reported as miscellaneous tonnage in other States.

Consumption of mixtures was substantially higher in most of the Central and South Atlantic States. Consumption decreased in Arizona, Florida, Hawaii, Montana, New York, Rhode Island, and Vermont. Decreases ranged from 0.3% (Florida) to 28.9 per cent (Montana), but the total decrease of 24,811 tons in these States represented less than 0.2 per cent of the national consumption.

N-P-K mixtures (table 1) represented 90.1 per cent of the total tonnage of mixtures, while the other types (N-P, P-K, N-K) accounted for 2.6, 5.5 and 1.8 per cent, respectively. The N-P-K type comprised more than 80 per cent of the tonnage of mixtures in all regions except the Mountain and Pacific. In these regions, N-P-K mixtures represented 52.1 and 75.1 per cent and the N-P type represented 47.8 and 23.7 per cent, respectively. Although substantially greater tonnages of mixtures were used, the proportions in which they were consumed in these classes differed little from that in 1957–58.

In the United States, excluding Hawaii and Puerto Rico, 118 grades of mixtures were each used in quantities of 10,000 tons or more. Only 117 of these are listed in table 4 as one grade was marketed by less than three producers. The 118 grades totaled 14,470,486 tons and accounted for 91.64 per cent of the quantity of mixtures used. Other grades consumed in amounts of 2,500 to 9,999 tons totaled 113 (592,725 tons, 3.75 per cent), whereas those under 2,500 tons totaled 1,380 (350,504 tons, 2.22 per cent). The balance (376,678 tons, 2.39 per cent) represented mixtures not reported by grades.

Consumption of mixtures in Hawaii and Puerto Rico amounted to 278,634 tons in 161 grades. Many of the grades in Puerto Rico are similar to those used in other areas of the United States but most of those used in Hawaii are designated in fractional numbers.

The 15 grades consumed in largest tonnages in 1958–59 in each of the regions are shown in table 5, together with the quantities for each State in the region. At least 11 of the grades in each area were among the 15 consumed in largest tonnages in the preceding year, but not always in the same order of tonnage. In most cases, shifts in the order of grades resulted from increased use of grades of higher nitrogen content. Except in the Mountain region, the first four grades used in largest tonnage in 1957–58 also were the first four in 1958–59. The listed grades in 1958–59 accounted for 50 per cent or more of the total quantity of mixtures consumed in each of the States except California, Colorado, Florida, North Dakota, and Wyoming. In these States, they represented 19 to 33 per cent of the total. In California and Florida over 500 and 1,000 grades, respectively, are used annually whereas in Colorado, North Dakota, and Wyoming

TABLE 5. MIXTURES CONSUMED IN STATES AND REGIONS by grade, year ended June 30, 1959

State	Consumption of 15 principal grades in indicated region, Tons															Other grades		Total tons
																No.[1]	Tons[2]	
New England																		
	8-12-12	10-10-10	5-10-10	8-16-16	0-20-20	6-9-12	0-15-30	8-9-10	15-10-10	5-8-7	6-10-4	11-12-14	6-3-6	12-12-12	8-6-4			
Maine	66,827	27,242	5,687	16,583	1,307	11,581	790	9,495	998	1,624	236	6,974	0	5,889	168	34	15,937	171,338
New Hampshire	862	2,973	2,243	5,283	132	0	1,305	0	955	523	164	0	0	35	230	24	1,822	16,527
Vermont	326	8,568	4,737	7,536	9,785	0	3,460	0	1,981	18	70	0	4	36	60	20	1,578	38,159
Massachusetts	1,143	12,625	15,336	5,733	415	0	1,404	0	1,491	3,376	3,696	0	2,808	133	2,925	29	20,130	71,215
Rhode Island	1,192	1,449	5,273	536	138	0	284	0	193	455	694	0	0	9	1,614	27	3,111	14,948
Connecticut	1,126	11,456	8,456	2,798	716	0	3,567	0	1,891	1,309	2,152	0	3,658	41	1,035	73	23,220	61,432
Total	71,476	64,313	41,732	38,469	12,493	11,581	10,810	9,495	7,509	7,305	7,019	6,974	6,470	6,143	6,032	97	65,798	373,619
Middle Atlantic																		
	5-10-10	10-10-10	5-10-5	8-16-16	0-20-20	3-12-6	6-12-12	10-6-4	4-8-12	3-12-12	10-20-20	12-12-12	2-12-12	5-10-15	4-12-12			
New York	139,959	65,301	109,313	59,579	16,572	1,204	15,668	18,591	1,487	2,417	9,226	18,143	59	9,121	272	88	76,314	543,226
New Jersey	111,100	13,978	24,035	2,187	2,438	651	5,400	7,740	476	1,720	2,131	306	12	1,595	237	78	55,414	229,420
Pennsylvania	274,329	61,491	18,146	38,817	39,936	30,994	10,379	4,586	8,247	9,949	8,529	2,315	4,953	1,674	12,975	152	64,667	591,987
Delaware	41,230	11,763	848	4,267	2,485	232	2,593	234	750	1,611	946	54	3,751	7,083	1,590	67	11,942	91,369
Dist. of Col.	98	124	1,747	0	1	8	3	822	3	0	0	0	0	0	0	21	1,004	3,810
Maryland	110,131	30,210	26,177	9,344	6,335	16,014	3,293	3,135	17,195	9,961	2,697	415	11,396	1,718	5,114	97	37,271	290,406
West Virginia	33,314	3,986	2,311	304	4,797	5,581	394	422	166	285	594	1,347	2,308	286	100	53	9,474	65,669
Total	710,161	186,853	182,577	114,498	72,564	54,684	37,730	35,520	28,324	25,943	24,123	22,580	22,479	21,477	20,288	240	256,086	1,815,887
South Atlantic																		
	4-12-12	5-10-10	3-9-9	2-12-12	5-10-15	4-8-12	4-10-6	8-8-8	5-10-5	10-10-10	4-8-8	4-7-5	6-6-6	4-8-10	6-8-6			
Virginia	18,250	200,894	52,009	130,008	4,126	0	0	7,010	55,791	49,254	0	0	0	7,890	12,562	23	147,724	684,918
North Carolina	27,721	474,214	312,174	134,966	0	59,280	0	40,157	0	19,900	0	0	0	54,653	39,358	19	210,765	1,373,188
South Carolina	158,858	36,001	48,805	0	1,870	59,007	120,453	7,443	31,625	4,938	0	0	0	0	4,137	28	166,929	640,066
Georgia	697,168	4,465	43,271	8,301	169,704	6,204	75	6,571	3,978	2,117	28,902	2	0	0	20,461	138	178,285	1,169,504
Florida	59,231	4,918	8,349	3,670	3,252	2,568	0	37,691	2,375	17,123	63,021	91,706	89,764	20,852	4,764	964	881,236	1,292,320
Total	961,228	719,892	464,608	276,945	178,952	127,059	120,528	98,872	93,769	93,332	91,923	91,708	89,764	83,395	81,282	1,006	1,586,939	5,160,196
East North Central																		
	5-20-20	12-12-12	3-12-12	4-16-16	10-10-10	6-24-12	5-10-10	0-20-20	6-24-24	3-9-27	0-10-30	7-28-14	5-20-10	10-6-4	8-32-0			
Ohio	119,356	135,113	246,254	53,094	51,930	57,976	100,409	21,878	5,471	822	467	1,734	10,205	13,344	7,825	118	151,438	977,316
Indiana	248,544	167,320	54,938	168,226	34,477	21,764	2,142	31,232	32,808	16,325	9,192	3,706	1,371	2,929	20,888	150	106,154	922,016
Illinois	68,588	76,138	34,920	77,765	81,945	12,432	8,825	22,849	25,900	16,126	3,518	33,367	4,243	3,213	7,179	143	183,907	660,915
Michigan	143,271	120,751	82,312	54,121	18,550	52,721	2,830	9,924	2,911	2,688	2,151	183	23,420	18,268	1,795	96	75,636	651,532
Wisconsin	120,067	9,866	31,015	34,023	35,915	4,831	339	25,293	37,242	17,353	34,155	744	446	751	674	85	68,400	420,716
Total	699,826	509,188	449,439	427,229	222,817	149,324	114,545	111,176	104,332	53,314	49,483	39,734	39,685	38,507	38,361	270	585,535	3,632,495
West North Central																		
	12-12-12	5-20-20	6-24-12	10-10-10	5-20-10	8-24-8	6-24-24	0-20-20	8-24-12	3-12-12	10-20-0	16-48-0	10-20-10	8-32-0	15-15-0			
Minnesota	11,012	99,826	65,618	11,195	6,002	0	16,708	14,678	33,950	293	2,276	865	709	3,358	851	130	127,908	395,249
Iowa	27,320	121,769	5,319	43,294	58,627	457	11,602	12,826	810	5,684	12,208	1,325	4,917	9,860	7,564	224	111,053	434,635
Missouri	246,697	17,885	1,479	11,758	938	31,291	9,944	9,971	0	23,410	0	0	6,511	0	0	32	171,066	530,950
North Dakota	626	326	1,328	46	35	0	128	20	1,427	0	32	3,022	25	193	214	64	32,103	39,589
South Dakota	56	23	277	158	22	0	0	75	97	0	1,400	145	186	1,997	1,301	64	5,532	11,269
Nebraska	1,196	558	49	183	1,342	486	107	449	0	0	4,193	2,418	2,699	5,349	4,448	117	22,888	46,361
Kansas	6,241	388	3	1,754	7	18,880	134	426	0	335	9,043	16,667	8,229	878	7,019	56	25,015	94,619
Total	293,144	240,775	74,073	68,388	66,973	50,714	38,623	38,445	36,284	29,722	29,152	24,442	23,276	21,635	21,397	331	495,565	1,552,608
East South Central																		
	5-12-12	4-10-7	4-12-12	6-8-8	5-10-15	0-14-14	4-12-8	5-10-5	10-10-10	5-10-10	3-9-6	3-12-12	8-8-8	0-20-20	5-20-20			
Kentucky	41,106	0	1,479	0	108,787	3	93,049	1,953	53,833	15,928	9,094	28,186	284	8,355	26,419	145	97,367	485,643
Tennessee	122,558	473	1,488	1,041	24,581	229	4,684	3,644	6,769	11,723	28,262	3,718	842	7,904	159	115	58,066	476,761
Alabama	499	268,315	251,078	56,967	63	125,570	0	1,091	9,770	294	10	5	23,011	7,855	20	70	57,534	802,082
Mississippi	4,158	5,340	2,851	142,955	0	2,559	8	67,791	7	13,445	0	573	6,826	5,305	3	54	62,097	313,918
Total	168,321	274,128	256,896	201,163	133,831	128,361	97,741	74,479	70,379	41,390	37,366	32,482	30,963	29,439	26,601	224	275,064	2,078,604
West South Central																		
	10-20-10	5-10-5	12-12-12	8-8-8	6-12-6	12-24-12	6-24-24	6-8-12	13-13-13	3-12-12	10-20-0	5-20-20	0-24-24	6-8-8	0-20-20			
Arkansas	22,477	28,314	16,980	1,635	174	464	3,587	16,561	5,068	1,376	20	1,427	11,592	106	7,231	57	51,542	168,554
Louisiana	5,813	18,494	24,152	30,397	320	1,838	11,819	162	4,828	12,412	1	9,517	0	11,041	3,561	58	25,609	159,964
Oklahoma	31,933	2,809	631	219	7,970	2,448	788	3	418	845	7,470	697	0	0	181	49	14,832	71,244
Texas	117,847	24,419	5,334	11,891	29,848	19,995	1,602	4	6,115	621	7,360	2,684	3	87	170	122	63,574	291,554
Total	178,070	74,036	47,097	44,142	38,312	24,745	17,796	16,730	16,429	15,254	14,851	14,325	11,595	11,234	11,143	178	155,557	691,316
Mountain																		
	24-20-0	10-20-5	20-20-0	6-10-4	21-20-0	20-10-0	8-24-0	10-20-0	10-10-10	16-16-8	8-25-0	10-20-10	13-11-0	10-10-5	10-18-5			
Montana	265	0	747	175	0	418	210	255	0	199	0	0	0	0	48	19	842	3,159
Idaho	5,106	0	3,114	260	0	573	1,653	138	7	424	0	0	233	0	73	38	1,993	13,574
Wyoming	13	0	161	30	0	58	11	220	0	63	0	27	0	0	31	26	864	1,478
Colorado	0	4	460	965	106	249	0	153	949	623	0	204	0	121	820	83	9,542	14,196
New Mexico	0	327	421	106	0	115	378	26	28	0	0	179	0	31	0	28	1,210	2,821
Arizona	0	6,107	0	398	3,818	2,362	579	1,614	1,295	444	1,447	1,097	0	893	0	51	9,182	29,236
Utah	1,185	0	222	2,802	0	64	0	65	0	317	0	4	1,230	0	99	22	755	6,743
Nevada	0	0	161	496	0	23	0	147	121	60	198	0	0	111	0	18	1,000	2,317
Total	6,569	6,438	5,286	5,232	3,924	3,862	2,831	2,618	2,400	2,130	1,645	1,511	1,463	1,156	1,071	176	25,388	73,524
Pacific																		
	10-10-10	10-10-5	6-10-4	17-7-0	15-8-4	8-8-4	10-20-20	8-24-0	11-8-4	6-20-20	10-16-8	5-3-2	12-8-4	4-10-10	5-10-10			
Washington	481	481	2,475	0	0	4	5,087	5,246	0	1,897	403	1,682	3,749	0	2,543	109	22,327	46,375
Oregon	738	62	3,446	0	0	0	2,405	1,840	0	2,897	3,909	2,424	0	0	653	75	12,722	31,096
California	32,632	16,961	10,224	12,577	8,026	7,548	0	0	6,173	0	0	0	0	3,535	0	3/ 6	236,997	334,673
Total	33,851	17,504	16,145	12,577	8,026	7,552	7,492	7,086	6,173	4,794	4,312	4,106	3,749	3,535	3,196	148	272,046	412,144
Other[4]																		
	14-4-10	15-4-7	14-2-8	10-10-8	12-6-10	10-6-20	8-6-10	12-6-8	6-8-10	12-4-10	13-3-12	12-3-16	9-10-5	12-2-10	12-10-5			
Puerto Rico	72,693	21,345	18,832	13,438	10,197	9,972	9,925	8,349	7,047	6,569	6,128	5,596	4,915	4,113	4,105	22	20,913	224,137
United States[5]																		
	5-10-10	4-12-12	5-20-20	12-12-12	10-10-10	3-12-12	6-12-12	3-9-9	5-10-5	4-16-16	5-10-15	4-10-7	*2-12-12	0-20-20	6-8-8			
New England	41,732	0	0	6,143	64,313	5	2,120	0	5,821	0	4	0	0	12,493	3,478	103	237,510	373,619
Mid. Atlantic	710,161	20,288	2,124	22,580	186,853	25,943	37,730	664	182,577	645	21,477	0	22,479	72,964	87	241	509,715	1,815,887
So. Atlantic	719,892	961,228	0	3,861	93,332	73,332	23,052	464,608	93,769	1,062	178,952	31,710	276,945	5,595	36,064	1,007	2,197,344	5,160,196
E. No. Cent.	114,545	1,545	699,826	509,188	222,817	449,439	33,230	218	11,992	427,229	10,408	0	3	111,176	0	273	1,040,879	3,632,495
W. No. Cent.	1,911	44	240,775	293,144	68,388	29,722	12,641	0	6,373	15,457	2	0	0	38,445	0	335	845,706	1,552,608
E. So. Cent.	41,390	256,896	26,601	17,673	70,379	32,482	368,321	531	74,479	4,170	133,831	274,128	3,074	29,439	201,163	224	544,047	2,078,604
W. So. Cent.	9,871	134	14,325	47,097	5,413	15,254	5,770	0	74,036	0	420	0	0	11,143	11,234	182	496,619	691,316
Mountain	2	0	0	379	2,400	0	21	0	418	0	0	0	0	34	0	185	70,270	73,524
Pacific	2,196	0	196	573	33,851	0	17	0	235	0	0	0	0	968	0	156	373,108	412,144
Total	1,642,700	1,240,135	983,847	900,038	747,746	626,227	482,902	466,021	449,700	448,563	345,094	305,838	302,501	281,857	252,026	1,596	6,315,198	15,790,393

1/ Excludes mixtures not reported by grade. 2/ Includes the tonnage of mixtures not reported by grade. 3/ Total number of mixtures exceeds 500 of which only 14 were reported by grade. 4/ Total consumption in Hawaii was 54,497 tons of mixtures, comprising 128 grades, most of which were manufactured to consumers' specifications. 5/ Excludes Hawaii and Puerto Rico.

TABLE 6. RATIOS OF PRIMARY NUTRIENTS IN MIXTURES consumed in United States, years ended June 30, 1958 and 1959[1]

Nutrient ratio[2]	Mixtures consumed: Quantity 1958 Tons	Quantity 1959 Tons	Per cent of total 1958 Per cent	Per cent of total 1959 Per cent
1:2:2	2,245,038	**2,481,685**	16.3	**16.1**
1:4:4	2,104,639	**2,231,166**	15.3	**14.5**
1:1:1	1,868,314	**2,151,158**	13.6	**14.0**
1:3:3	1,535,657	**1,718,637**	11.2	**11.1**
1:2:1	800,611	**797,524**	5.8	**5.2**
0:1:1	546,498	**569,675**	4.0	**3.7**
1:2:3	331,163	**513,243**	2.4	**3.3**
1:4:2	381,942	**504,242**	2.8	**3.2**
1:6:6	316,992	**320,625**	2.3	**2.1**
4:10:7	306,711	**306,146**	2.2	**2.0**
Sub-total	10,437,565	**11,594,101**	75.9	**75.2**
Other[3]	3,303,974	**3,819,614**	24.1	**24.8**
Total[4]	**13,741,539**	**15,413,715**	**100.0**	**100.0**

[1] Excludes Hawaii and Puerto Rico. [2] N:available P_2O_5:K_2O. [3] All other ratios of mixtures reported by grade. [4] Excludes mixtures not reported by grade.

TABLE 7. PRIMARY PLANT NUTRIENT CONTENT of mixtures and of materials, as a weighted average, year ended June 30, 1959[1]

Percent

State and region	Mixtures[2]: N	Available P_2O_5	K_2O	Total	Materials: Single nutrient[3]: N	Available P_2O_5	K_2O	Multiple nutrient[2]	Total nutrients	Total in mixtures and materials
Maine	8.37	12.02	12.48	32.87	31.00	20.21	60.99	9.84	18.19	32.16
New Hampshire	7.49	12.53	13.33	33.35	31.47	20.17	59.85	10.64	22.78	31.13
Vermont	5.64	14.71	16.14	36.49	34.41	19.94	61.58	9.63	22.04	32.04
Massachusetts	7.40	10.09	9.72	27.11	19.35	20.16	59.77	11.52	16.93	24.96
Rhode Island	6.60	10.12	10.24	26.96	21.06	19.00	57.74	9.86	15.55	25.72
Connecticut	7.32	9.89	10.43	27.64	28.09	21.63	54.65	14.90	21.36	26.25
New England	7.01	11.52	11.95	31.08	25.76	20.32	58.28	12.20	19.83	29.33
New York	6.70	12.04	10.41	29.15	28.59	21.71	50.53	10.46	23.86	28.48
New Jersey	5.90	10.73	10.37	27.00	27.31	19.63	53.72	11.38	22.81	26.58
Pennsylvania	5.59	12.51	11.91	30.01	29.19	19.17	56.21	14.99	23.49	29.32
Delaware	5.56	11.18	12.59	29.33	31.20	20.66	56.42	12.12	29.63	29.34
District of Columbia	7.67	9.47	6.02	23.16	15.99	20.47	60.73	10.38	11.12	20.50
Maryland	5.19	11.30	10.86	27.55	31.13	17.59	55.59	15.18	26.65	27.49
West Virginia	4.64	12.20	10.76	27.60	22.70	23.08	60.75	14.07	23.45	27.09
Middle Atlantic	5.90	11.87	11.08	28.85	28.91	20.45	53.90	12.55	23.92	28.33
Virginia	4.33	11.07	11.77	27.17	23.96	27.88	20.43	25.76	23.86	26.77
North Carolina	4.62	9.42	10.67	24.71	25.07	16.80	38.20	11.25	25.15	24.80
South Carolina	4.26	10.20	10.48	24.94	20.84	15.45	58.94	26.93	23.22	24.46
Georgia	4.51	10.76	12.02	27.29	28.29	15.75	57.37	17.49	28.26	27.46
Florida	6.09	6.62	9.12	21.80	24.72	13.65	41.35	17.77	21.79	21.89
South Atlantic	4.88	9.34	10.71	24.95	24.81	16.81	41.17	18.58	24.83	24.93
Ohio	6.14	14.73	13.16	34.03	33.04	25.80	57.62	28.75	32.44	33.86
Indiana	6.46	16.77	16.09	39.32	42.59	29.57	60.59	41.40	45.64	40.69
Illinois	7.37	16.20	13.65	37.22	37.51	8.53	61.89	25.84	21.54	28.03
Michigan	6.42	15.92	14.64	37.18	41.23	18.86	55.96	16.22	32.77	36.68
Wisconsin	5.54	16.23	20.78	41.55	45.17	23.37	59.36	12.69	40.39	41.41
East North Central	6.41	15.90	15.18	37.39	39.04	10.55	60.83	24.12	28.08	34.73
Minnesota	6.17	21.44	15.76	43.37	48.28	43.16	60.34	41.28	46.78	44.33
Iowa	7.11	18.73	12.94	38.78	44.63	34.87	60.80	37.71	41.90	39.95
Missouri	10.07	13.38	12.73	36.18	44.19	6.20	60.97	26.54	21.19	30.06
North Dakota	15.63	27.85	3.82	47.30	43.13	45.55	34.81	49.36	48.26	47.98
South Dakota	13.92	22.01	1.69	37.62	39.50	44.24	6.90	40.33	40.94	39.98
Nebraska	10.52	23.76	3.60	37.88	51.55	42.80	32.53	50.86	50.68	48.73
Kansas	11.93	24.39	5.87	42.19	47.61	43.60	61.11	49.70	49.30	48.24
West North Central	8.54	18.55	12.56	39.65	45.95	21.16	60.00	43.34	38.18	38.93
Kentucky	5.42	11.80	12.36	29.58	36.48	25.86	54.78	38.05	35.10	30.60
Tennessee	5.93	12.13	11.91	29.97	33.40	24.62	59.98	36.05	32.95	30.58
Alabama	3.68	8.61	10.43	22.72	25.81	14.46	59.74	34.28	24.84	23.26
Mississippi	6.41	10.26	9.42	26.09	38.51	12.74	59.13	40.52	30.94	28.77
East South Central	5.01	10.41	11.07	26.49	33.98	16.55	51.54	38.22	29.87	27.51
Arkansas	6.79	15.09	14.83	36.71	38.07	37.26	59.53	37.68	41.58	39.30
Louisiana	7.12	13.66	11.38	32.16	39.70	17.06	56.28	33.58	37.58	34.59
Oklahoma	9.19	19.70	7.86	36.75	38.09	20.62	58.03	41.23	32.98	34.99
Texas	9.27	17.21	8.56	35.04	51.14	26.17	43.84	37.86	43.44	39.74
West South Central	8.16	16.13	10.67	34.96	44.29	26.69	58.01	38.24	41.09	38.16
Montana	14.70	20.68	4.55	39.91	41.03	45.71	61.20	44.64	44.48	44.13
Idaho	18.66	20.13	1.23	40.02	29.91	45.70	62.20	39.80	35.31	35.82
Wyoming	14.47	19.46	2.68	36.61	40.36	44.94	56.80	61.35	45.48	44.64
Colorado	13.30	20.07	7.62	40.99	39.71	46.65	58.41	54.17	43.64	43.20
New Mexico	11.50	14.68	3.64	29.82	49.05	34.51	58.68	40.04	40.70	39.95
Arizona	13.15	17.17	4.12	34.44	40.90	34.10	54.07	40.30	40.28	39.33
Utah	12.37	14.56	3.00	29.93	33.40	40.54	62.24	40.42	36.58	35.36
Nevada	11.94	12.69	2.86	27.49	35.55	47.99	55.04	35.61	37.81	33.47
Mountain	14.12	18.00	4.09	36.21	37.60	42.35	56.10	42.61	39.86	39.06
Washington	10.18	14.90	8.54	33.62	39.15	35.79	50.20	37.86	39.08	38.00
Oregon	9.62	15.76	8.64	34.02	29.64	23.56	55.12	36.93	30.81	31.33
California	11.13	11.64	6.36	29.13	30.20	26.52	54.95	13.15	24.19	25.25
Pacific	10.91	12.32	6.78	30.01	31.46	27.21	53.06	15.97	26.65	27.34
Average for 48 States & D. C.	6.11	12.65	11.91	30.67	35.08	18.59	55.79	26.41	31.05	30.79
Hawaii	12.79	8.30	20.18	41.27	23.25	22.06	59.44	64.53	30.34	34.75
Puerto Rico	12.37	5.26	10.16	27.79	23.16	36.50	48.62	30.61	23.47	27.23
United States: 1958-59	6.22	12.54	11.91	30.67	34.86	18.61	55.89	26.52	31.01	30.78
1957-58	5.96	12.53	11.73	30.22	34.43	17.95	55.67	25.48	30.11	30.18
1956-57	5.74	12.36	11.43	29.53	32.62	17.92	55.20	24.14	28.81	29.30

[1] Excludes fertilizers not guaranteed to contain one or more of the primary nutrients, N, P_2O_5, or K_2O. [2] Guaranteed to contain two or more of the primary nutrients. [3] Guaranteed to contain one of the primary nutrients. [4] Includes an average weight of 2 percent for the colloidal phosphate and 3 percent for the phosphate rock marketed for direct application.

Table 7, footnote 4 should read—
[4] Includes a weighted average of 2 per cent for the colloidal phosphate and 3 per cent for the phosphate rock marketed for direct-application.

direct-application materials dominate the tonnage of fertilizer consumed.

The total tonnage of the 15 grades shown for the United States, excluding Hawaii and Puerto Rico, represented 60.0 per cent of the tonnage of all mixtures. Nearly two-thirds of the tonnage was supplied by approximately one per cent of the number of reported grades. As in the preceding year, the 5–10–10, 4–12–12, and 5–20–20 grades were consumed in largest tonnage, in descending order, respectively. The other 12 grades were the same as in 1957–58 but in general their relative tonnages differed appreciably.

The 5–10–10 grade and the 1:2:2 plant-nutrient ratio were consumed in larger tonnage than any other grade and ratio, respectively, both in 1957–58 and in 1958–59. The total tonnage of all grades of mixtures reported in the 10 nutrient ratios listed in table 6 accounted for 75.2 per cent of the total use of mixtures reported by grade in the United States (excluding Hawaii and Puerto Rico, in 1958–59. These 10 ratios are in the same relative order as in 1957–58, except that the 1:2:3 ratio precedes the 1:4:2 in 1958–59.

The weighted average primary plant nutrient content of mixtures is shown for each State and region in table 7. The national average in 1958–59 was 6.22 per cent of N, 12.54 per cent of available P_2O_5, and 11.91 per cent of K_2O, a total of 30.67 per cent. Compared with the corresponding averages in 1957–58, the increase was highest for N (4.36 per cent), while that for available P_2O_5 was only 0.08 per cent, and for K_2O 1.53 per cent. These percentages reflect the trend toward increased concentration of primary nutrients in mixtures used throughout the United States. The high rate for nitrogen resulted from substantial increases in average nitrogen contents in 45 areas and decreases in only 5. The low rate for available P_2O_5 was the result of decreases in 27 areas offsetting increases in 22. The rate for K_2O increased in 29 areas and decreased in 22.

MATERIALS

In 1958–59, the total consumption of materials for direct application, including secondary and trace nutrient materials, amounted to 9,243,645 tons or 36.5 per cent of all fertilizers used (table 3). The quantity of these materials was 1,080,905 tons (13.2 per cent) more than the 8,162,740 tons used in 1957–58. In most States, changes in consumption of direct-application materials closely corresponded to changes in the consumption of mixtures. The tonnages of the principal materials consumed in 1958–59 are shown in tables 1 and 8, and changes in consumption from the preceding year are summarized, by classes, in table 9.

Although the total tonnage of all classes increased compared with 1957–58, the change was largest in chemical nitrogen materials and in secondary and trace nutrient materials, followed by phosphates, potash, and natural organics, in the order named. More than one-half of the increase in consumption of materials was in chemical nitrogen materials. Consumption of this class was 616,427 tons (15.9 per cent) more than in 1957–58. Increases in the other classes of materials were 283,476 tons (30.2 per cent) for the secondary and trace nutrients, 109,912 tons (4.6 per cent) for phosphates, 46,394 tons (10.3

TABLE 8. MATERIALS FOR DIRECT-APPLICATION CONSUMED, by class and by product, year ended June 30, 1959[1]

Tons

State and region	Chemical nitrogen materials									Natural organics[2/]	Phosphate materials[2/]				Potash materials[2/]		Total	
	Ammonia (anhydrous)	Ammonium nitrate	Ammonium nitrate-limestone mixtures	Ammonium sulfate	Calcium cyanamide	Nitrogen solutions and aqua ammonia[2/]	Sodium nitrate	Urea	Other[2/]		Phosphate rock[3/]	Superphosphates		Other	Chlorides 50-62 percent grades	Other	Primary nutrient materials	Secondary and trace nutrient materials[2/]
												Grades 22 percent and under	Grades over 22 percent					
Maine	0	1,106	5	97	93	239	113	147	96	4,252	2	2,198	10	127	164	2	8,651	37
New Hampshire	0	834	3	2	57	73	59	165	25	875	51	2,081	2	55	112	5	4,399	8
Vermont	0	1,013	16	0	0	159	33	313	11	358	152	14,463	0	48	390	1	16,957	14
Massachusetts	0	1,337	32	248	261	205	796	282	252	10,989	63	3,301	0	720	936	22	19,106	6
Rhode Island	0	92	0	5	70	0	42	67	66	1,158	20	216	0	50	32	2	1,820	12
Connecticut	0	785	2	88	170	897	674	606	138	7,385	72	4,381	357	566	377	768	17,430	20
New England	0	5,167	58	440	651	1,481	1,717	1,580	642	25,017	360	26,640	369	1,566	1,871	800	68,363	97
New York	690	15,741	285	213	2,278	2,156	4,041	1,996	1,007	16,324	536	29,251	815	849	1,556	1,495	79,193	805
New Jersey	582	3,198	194	435	1,784	366	1,859	882	520	8,871	199	3,867	17	1,360	1,319	462	25,799	234
Pennsylvania	777	10,183	105	6,107	878	883	1,619	1,393	642	11,889	4,230	26,110	119	2,364	2,311	807	70,417	3,639
Delaware	43	1,015	41	12	760	933	143	242	31	434	40	286	33	104	197	30	4,344	300
District of Columbia	0	16	0	2	0	0	16	2	13	990	0	13	0	73	1	0	1,088	8
Maryland	971	3,818	719	41	1,324	1,670	2,669	372	178	2,155	1,681	3,472	62	1,098	683	170	21,077	987
West Virginia	0	751	41	261	13	0	1,201	79	29	315	135	6,656	812	98	208	1	10,722	17
Middle Atlantic	3,063	34,722	1,385	7,091	6,937	6,008	11,548	4,966	2,420	40,978	6,821	69,615	1,858	5,940	6,275	2,965	212,636	5,990
Virginia	637	5,908	24,795	1,128	1,081	19,270	14,462	176	10	1,072	1,073	8,520	1,369	3,015	4,334	13,823	94,811	16,380
North Carolina	9,598	18,176	122,007	1,085	5,075	50,360	73,872	166	0	4,813	1,957	17,317	0	5,642	10,755	10,935	331,758	49,359
South Carolina	1,927	21,701	72,125	215	560	34,931	78,438	52	0	1,498	204	10,749	172	5,832	15,903	5,686	250,013	5,079
Georgia	13,059	85,807	39,397	3,045	813	31,481	61,760	289	1,405	2,056	1,197	9,150	19	5,407	6,522	752	262,161	45,839
Florida	1,251	25,413	4,811	2,927	1,906	7,641	31,906	2,152	11,230	21,661	15,604	7,805	1,204	6,431	3,105	19,192	167,085	3,101
South Atlantic	28,472	156,025	263,135	8,422	9,371	138,085	260,438	2,868	13,345	31,083	19,015	53,541	5,460	26,327	40,629	49,588	1,105,828	121,760
Ohio	5,496	25,219	271	23,776	313	8,497	620	4,451	901	7,598	5,927	15,793	7,159	4,979	9,281	901	121,176	398
Indiana	27,962	49,172	20	11,526	270	49,351	148	8,279	213	4,040	10,358	3,717	16,873	7,044	66,422	599	255,994	111
Illinois	41,626	67,664	134	72,868	171	30,439	68	1,753	788	13,392	506,250	22,192	63,895	9,164	100,820	1,657	935,081	743
Michigan	8 124	11,066	30	4,006	38	12,650	361	3,180	1,341	15,363	3,986	3,680	1,317	2,757	6,086	1,436	82,161	1,835
Wisconsin	4,7675	8,714	0	1,341	0	4,903	0	335	627	10,141	2,685	2,912	1,705	1,215	16,785	753	56,791	345
East North Central	87,881	161,815	455	113,517	812	105,840	1,197	17,998	3,870	51,728	528,806	54,494	90,949	25,159	201,314	5,346	1,451,203	3,332
Minnesota	18,761	24,182	30	783	0	29,649	0	227	207	8,713	1,091	5,453	20,583	29,601	13,682	208	153,170	98
Iowa	30,090	68,11	0	5,525	0	28,806	0	1,118	144	4,347	6,028	36,056	32,799	30,877	16,963	48	260,890	34
Missouri	28,871	79,604	0	1,034	0	18,030	394	481	200	4,300	229,661	1,858	13,307	6,188	17,830	219	401,977	275
North Dakota	1,026	3,464	0	130	0	268	0	30	12	65	0	70	18,268	68,954	7	15	90,309	0
South Dakota	1,387	8,613	0	43	0	1,727	0	359	95	610	40	239	6,222	8,050	57	0	27,442	2
Nebraska	80,914	66,727	0	1,686	0	69,427	0	2,294	75	158	912	1,285	19,119	14,356	386	965	258,540	161
Kansas	7,500	81,159	0	501	0	21,050	0	458	47	691	362	714	30,008	49,453	1,577	0	195,382	116
West North Central	168,549	331,880	30	9,598	0	170,257	394	4,967	780	19,286	238,594	45,675	140,306	207,535	50,504	1,455	1,390,210	686
Kentucky	4,169	37,429	85	897	1,534	3,679	1,871	340	13	664	9,519	21,744	2,488	9,488	10,372	5,945	110,237	159
Tennessee	9,047	39,514	131	207	2,192	165	24,666	34	27	1,375	3,650	10,060	1,806	9,185	12,594	9,304	123,357	443
Alabama	5,803	81,056	32,217	12,164	279	2,722	75,337	10	1,182	664	1,058	22,967	83	28,350	9,065	154	273,113	4,224
Mississippi	41,312	132,661	5,781	643	3,125	13,112	44,269	3,159	69	125	4,049	32,882	1,563	87,890	16,006	579	387,229	171
East South Central	60,331	290,662	38,216	13,911	7,130	19,678	146,143	3,543	1,291	2,828	18,276	87,453	5,940	134,915	48,037	15,982	894,536	5,017
Arkansas	24,104	50,701	17	3,563	5,546	12,437	32,033	13,003	381	39	291	4,933	10,564	1,498	31,636	280	191,026	3
Louisiana	25,710	35,708	0	10,583	1,136	9,175	23,163	1,882	538	469	2,730	7,316	1,386	5,682	3,081	337	130,202	1,044
Oklahoma	1,967	6,688	0	1,259	30	694	524	235	22	1,406	3,943	19,438	10,267	16,026	326	29	62,654	25
Texas	34,473	28,806	1,572	66,749	1,280	9,267	1,481	8,120	85	4,941	12,829	29,890	20,190	88,337	1,742	1,298	370,990	2,832
West South Central	145,854	121,903	2,541	82,154	7,992	31,573	57,201	23,180	1,026	6,855	19,791	61,577	42,407	111,553	37,187	1,894	754,692	3,904
Montana	1,406	5,303	1	701	0	239	0	11	29	172	0	0	18,252	11,463	31	0	37,608	469
Idaho	5,120	21,153	3	21,496	0	20,080	0	408	402	273	90	83	24,842	18,147	726	0	112,805	8,473
Wyoming	1,013	3,385	0	629	0	964	0	530	22	61	0	0	4,814	2,599	29	5	14,051	402
Colorado	6,138	24,374	2	5,410	7	3,888	0	2,132	153	2,378	40	95	16,221	9,769	434	331	71,372	3,290
New Mexico	9,825	2,062	59	3,395	0	1,460	8	1,309	68	790	0	7,828	9,480	6,893	49	8	38,038	252
Arizona	25,014	10,589	141	22,149	599	16,025	254	12,907	8,397	1,703	125	5,852	3,144	42,020	202	939	150,100	16,643
Utah	1,484	9,493	7	4,810	0	143	0	277	584	454	0	2,151	7,317	3,327	62	0	30,109	401
Nevada	315	101	1	481	0	586	1	32	20	84	0	1	479	1,094	1	7	1,184	385
Mountain	45,515	76,460	214	59,051	606	43,387	308	17,626	9,675	5,915	215	15,810	84,551	95,112	1,536	1,290	457,467	30,315
Washington	37,025	88,392	301	14,976	126	63,628	110	1,949	653	3,733	498	4,417	7,720	24,286	4,062	2,076	188,944	7,758
Oregon	9,954	28,475	14	39,388	806	32,172	0	3,489	2,244	1,814	388	9,270	2,117	26,340	1,370	494	158,535	10,698
California	93,481	42,276	0	173,401	6,382	345,335	101	22,310	29,215	308,598	1,039	75,150	17,933	100,764	1,388	5,635	1,221,245	1,030,645
Pacific	140,462	94,143	315	227,761	7,317	421,135	211	27,748	32,812	334,145	1,919	89,037	27,770	151,390	7,030	8,205	1,571,424	1,049,101
Total	680,289	1,272,797	306,351	521,991	40,838	938,146	479,253	104,476	65,881	517,795	833,521	503,844	399,610	759,697	394,383	87,525	7,906,159	1,220,222
Hawaii	0	0	0	3,818	0	41,511	115	5,596	103	60	4,147	5,373	3,866	3,308	11,176	1,623	80,650	2,982
Puerto Rico	784	0	0	24,176	0	7,601	6	144	6	93	0	55	98	258	22	203	33,432	0
United States: 1958-59	681,073	1,272,797	306,351	549,945	40,838	987,258	479,374	110,176	65,992	517,948	837,668	509,272	403,366	763,251	405,581	89,351	8,020,441	1,223,204
1957-58	583,434	1,116,908	263,512	577,111	46,348	689,608	435,509	98,383	66,564	491,252	851,545	477,890	374,363	700,047	364,790	83,748	7,223,012	939,728
1956-57	452,702	1,105,196	300,586	516,183	46,978	627,310	493,159	108,916	55,198	479,671	836,183	559,998	373,969	645,813	376,169	84,730	7,062,961	943,243

1/ Does not include liming materials or the quantities of materials used for manufacture of commercial mixtures. 2/ The principal kinds are shown separately, by regions, in table 1. 3/ Includes colloidal phosphate, the quantity of which is shown separately, by regions, in table 1. 4/ Includes an estimate of 270,000 tons of dried manures.

per cent) for potash, and 24,696 tons (5.0 per cent) for the natural organics.

Consumption of nearly all chemical nitrogen materials for direct application substantially increased in 1958–59. However, less ammonium sulfate and calcium cyanamide were used than in 1957–58. The decrease for ammonium sulfate may have been due to supply and distribution problems inasmuch as consumption for direct application increased in most producing areas. However, the much larger tonnage of mixtures consumed (in the formulation of which ammonium sulfate finds principal use) may have resulted in shortages for direct application in areas distant from production centers. The use of calcium cyanamide decreased in many areas.

Consumption of the natural organic products increased about five per cent from the preceding year. Dried manures accounted for most of the increase in this class.

Among the phosphate products, the principal changes involved increased use of ammoniated phosphates and superphosphates, and decreased use of phosphate rock. The principal changes occurred in States in which these products were used in large quantity. The increase in the tonnage of the ammoniated phosphate grades (11–48, 13–39, 16–20, 27–14) accounted for more than one-half of the increase in the phosphate class. The 21–53 grade, however, was not used for direct application to as great an extent as in 1957–58. The separate tonnages of these ammoniated phosphate grades are listed, by States, in table 10. All other N-P grades such as: 8–24–0, 16–48–0, and 24–20–0, are included as mixtures in tables 1, 4 and 5. In addition to the seven N-P grades listed in table 10, there were reported 161 N-P grades consumed in the United States (exclusive of Hawaii and Puerto Rico).

Except for potassium sulfate and a few of the miscellaneous potash products for which decreases were negligible, consumption of potash products increased in 1958–59.

The quantities of the secondary and trace nutrient materials, particularly those containing calcium and sulfur, were substantially higher in 1958–59 than in 1957–58. The use of gypsum (1,160,667 tons) comprising nearly 95 per cent of the total tonnage of this class of products increased 271,965 tons (30.6 per cent).

The weighted average primary-nutrient contents of the direct-application materials used in each of the areas are shown in table 7. These averages were computed from the actual analysis and reported tonnages of the individual materials comprising the respective classes. In 1958–59, single-nutrient nitrogen materials averaged 34.86 per cent N, phosphate materials 18.61 per cent available P_2O_5, and potash materials 55.89 per cent K_2O. Multiple-nutrient materials averaged 26.52 and all materials 31.01 per cent total plant nutrients. The corresponding averages in 1957–58 were 34.43, 17.95, 55.67, 25.48, and 30.11 per cent. The higher averages for 1958–59 reflect increased use of higher analysis products.

The averages for materials containing only N ranged from 15.99 per cent (District of Columbia) to 51.55 per cent (Nebraska). Processed tankage in the District of Columbia and anhydrous ammonia in Nebraska represented the principal products consumed in this class in these areas.

The single-nutrient P_2O_5 materials ranged from 6.20 per cent (Missouri) to 47.99 per cent (Nevada). The low average for Missouri resulted from the use of a large tonnage of phosphate rock with an estimated available P_2O_5 content of three per cent. The high average for Nevada resulted from use of calcium metaphosphate and superphosphates containing over 22 per cent available P_2O_5 as the principal phosphorus sources.

The range for the K_2O class was 20.43 per cent in Virginia resulting from use of a large tonnage of lime-potash mixtures (6 per cent K_2O content) to 63.92 per cent in South Dakota where a high-grade potassium chloride was the principal potash source.

The low for the multiple-nutrient class of materials was 9.63 per cent in Vermont and was due to a large tonnage of natural organics. The high of 64.53 per cent in Hawaii was due to the ammonium phosphates (11–48 and 21–53).

The weighted averages of the total nutrient contents of materials, shown in column 10, table 7, are indicative of the relative grades of products consumed in principal quantities in each designated area. It is evident from these averages that products consumed in the New England region have, on the average, a lower

primary-nutrient content than materials consumed in any other region.

PRIMARY PLANT NUTRIENTS

During the year ended June 30, 1959, fertilizers used in the United States contained 7,415,713 tons of primary plant nutrients (N, available P_2O_5, K_2O) (table 11). This represented a substantial increase in primary nutrients (903,326 tons, 13.9 per cent) over the preceding year. Consumption of nitrogen was 2,672,332 tons, an increase of 387,973 tons (17.0 per cent); available P_2O_5 2,551,287 tons or 258,397 tons (11.3 per cent) more; and K_2O 2,192,094 tons or 256,956 tons (13.3 per cent) above 1957–58.

Mixtures supplied 999,963 tons or 37.4 per cent of the N, 2,014,315 tons or 79.0 per cent of the available P_2O_5, and 1,914,-305 tons or 87.3 per cent of the K_2O. These quantities represented increases of 16.9, 12.0, and 13.7 per cent, respectively, over the preceding year.

Materials used for direct-application supplied 1,672,369 tons or 62.6 per cent of the N, 536,972 tons or 21.0 per cent of the available P_2O_5, and 277,789 tons or 12.7 per cent of the K_2O. These quantities represented increases of 17.0,8.6, and 10.6 per cent, respectively, from 1957–58.

Although the totals of primary nutrients were substantially higher for both mixtures and materials in 1958–59 than in 1957–58 as shown in table 12, consumption of one or more of the nutrients supplied either by mixtures or by materials decreased in 31 of the 51 areas. In 16 of these 31 areas, however, the decrease in the quantity of a nutrient supplied either by a mixture or a material was offset by an increase of that nutrient in the other category. In the other 15 areas the decrease of a nutrient in one category was not offset by an increase in the other category. Nitrogen decreased in three such areas, available P_2O_5 in eight, and K_2O in nine. These net decreases occurred mostly in the New England and Mountain regions.

Compared with 1957–58, the use of nitrogen increased 387,973 tons, of which 144,759 tons were supplied by mixtures and 243,214 tons by materials. The increase in nitrogen was largest in the West North Central region (35.5 per cent), followed by the East North Central region (26.2 per cent) and the South Atlantic region (15.6 per cent), and the smallest was in the New England region (6.8 per cent). In 1958–59, consumption of nitrogen in the West North Central region (476,383 tons) exceeded that in the South Atlantic region (475,723 tons) for the first time. The largest use of nitrogen in mixtures, however, was still in the South Atlantic region.

Compared with 1957–58, the use of available P_2O_5 increased 258,397 tons, of which 215,725 tons were supplied by mixtures and 42,672 tons by materials. As in the case of nitrogen, increases in available P_2O_5 were largest in the West North Central region (23.3 per cent), East North Central region (9.7 per cent), and South Atlantic region (12.0 per cent). Use decreased, however, in the New England region by 1.6 per cent.

Compared with 1957–58, the use of K_2O increased 256,956 tons of which 230,395 tons were supplied by mixtures and 26,561 tons by materials. Increases ranged from 6.9 per cent in the Middle Atlantic region to 29.3 per cent in the West North Central region. In the New England and Mountain regions the totals consumed, however, were about one per cent less.

The quantities of primary nutrients in the principal kinds of fertilizers used in 1958–59 (table 1) are shown by regions in table 13. More than one-half of the total consumption of nitrogen was as N-P-K mixtures and anhydrous ammonia—which supplied, respectively, 34.0 and 20.9 per cent. These two commodities accounted for over 50 per cent of the nitrogen consumed in each region except the Mountain and the Pacific. In these two, the principal use of nitrogen was as direct-application materials with more than one-half being used as anhydrous ammonia and ammonium nitrate in the Mountain region and as aqueous and anhydrous ammonia in the Pacific region.

More than 69 per cent of the total consumption of available P_2O_5 was as N-P-K mixtures. In all regions except the Mountain and Pacific regions, from 50 per cent (West North Central) to 91 per cent (South Atlantic) of the available P_2O_5 consumed was supplied in such mixtures. In the Mountain region superphosphate, grades over 22 per cent P_2O_5, and the N-P grades of mixtures and materials supplied, respectively, 45.3 and 37.2 per cent whereas in the Pacific region a greater diversification of fertilizers was used.

Seventy-seven per cent of the total consumption of K_2O was as N-P-K mixtures. The regional proportions ranged from 62 per cent (Pacific) to 86 per cent (Middle Atlantic).

The substantially higher increase of 14 per cent in the national consumption of primary plant nutrients recorded in 1958–59 over the previous year, appears to be attributable, at least in part, to an overall increase of 17 per cent in the sum of the planted acreages of corn and cotton (which followed changes in acreage allotments) as calculated from the 1959 Annual Summary of Crop Production (Crop Reporting Board, U. S. Department of Agriculture, December 1959). The percentage increase in consumption of primary plant nutrients in 1958–59 compared with 1957–58 was highest in those regions in which increases in the sum of the planted acreages of corn and cotton was highest (West North Central) and lowest in those regions in which there was little change in the sum of the planted acreages of these crops (New England). The planted acreages of these crops increased 22 per cent and that of the primary plant nutrients 29 per cent in the West North Central region. In the South Atlantic region the acreages increased 14 per cent with a corresponding increase in primary nutrients, whereas, in the New England region these changes were three and one per cent, respectively. ▲

(Additional tables appear on pages 69 and 70)

TABLE 9. CLASSES OF DIRECT-APPLICATION MATERIALS consumed in United States, years ended June 30, 1958 and 1959[1]

Class	Consumption 1958 Tons	Consumption 1959 Tons	Change from 1958 Tons	Change from 1958 Per cent
Chemical nitrogen materials	3,877,377	4,493,804	616,427	15.9
Natural organic materials	493,252	517,948	24,696	5.0
Phosphate materials	2,403,845	2,513,757	109,912	4.6
Potash materials	448,538	494,932	46,394	10.3
Secondary and trace nutrient materials	939,728	1,223,204	283,476	30.2
Total	8,162,740	9,243,645	1,080,905	13.2

[1]Includes Hawaii and Puerto Rico.

TABLE 10. AMMONIATED PHOSPHATES consumed as direct-application materials, by grades, year ended June 30, 1959[1]

Tons

State and region	Grade[2] 11-48	13-39	16-20	27-14	21-53
Maine	0	0	0	0	10
New England	0	0	0	0	10
New York	39	0	0	0	8
New Jersey	104	0	0	0	91
Pennsylvania	1,144	0	0	0	106
Delaware	2	0	0	0	0
Maryland	76	0	0	0	5
West Virginia	21	0	0	0	0
Middle Atlantic	1,386	0	0	0	210
Virginia	7	0	0	0	279
North Carolina	0	0	0	0	68
South Carolina	0	0	0	0	18
Georgia	0	0	0	0	263
Florida[3]	28	0	0	0	6
South Atlantic	35	0	0	0	634
Ohio	3,540	10	7	0	645
Indiana	5,408	23	11	0	1,011
Illinois	3,646	300	276	0	1,616
Michigan	1,450	0	0	0	636
Wisconsin	174	37	6	0	268
East North Central	14,218	370	294	0	4,176
Minnesota	13,386	3,188	5,967	506	804
Iowa	2,429	3,250	10,264	838	707
Missouri	900	18	1,274	0	765
North Dakota	32,535	5,964	28,721	1,314	295
South Dakota	1,473	273	5,518	418	287
Nebraska	3,575	1,954	6,039	5	2,538
Kansas	970	9,804	38,188	0	341
West North Central	55,268	24,451	95,971	3,081	5,737
Kentucky	0	6	0	0	534
Tennessee	0	5	0	9	1,045
Alabama	0	0	0	0	474
Mississippi	0	0	395	0	529
East South Central	0	11	395	9	2,582
Arkansas	21	112	1,094	0	0
Louisiana[3]	67	24	3,027	0	0
Oklahoma	482	6,692	8,756	0	73
Texas	4,200	9,828	70,788	4	955
West South Central	4,770	16,656	83,665	4	1,028
Montana	3,305	84	6,094	328	0
Idaho	1,451	42	12,483	2,557	0
Wyoming	149	21	536	65	1,432
Colorado	475	992	783	18	5,157
New Mexico	560	1,393	4,484	0	435
Arizona	3,787	1,931	30,418	534	2,239
Utah	947	3	1,639	266	12
Nevada	11	30	957	15	5
Mountain	10,685	4,496	57,394	3,783	9,280
Washington	3,977	1,471	6,505	10,859	119
Oregon	1,710	1,089	22,842	157	86
California[3]	10,064	3,466	69,298	2,441	1,704
Pacific	15,751	6,026	98,645	13,457	1,909
Hawaii	1,405	0	145	0	1,412
Puerto Rico	0	0	250	0	2
United States	103,518	52,010	336,759	20,334	26,980

1/ There was no consumption in States not listed. 2/ Including the quantity of these grades reported as mixtures. 3/ In addition, 101 tons of 4-16-0 grade specified as ammoniated superphosphate was consumed in Florida, 39 tons in Louisiana, and 2,018 tons of 3-18-0 grade in California.

Table 10, footnote 1 should read—
[1] No consumption was reported for States not listed.

TABLE 11. PRIMARY PLANT NUTRIENTS CONSUMED in mixtures and in mixtures and materials combined, year ended June 30, 1959

Tons

State and region	Consumption of nutrients in mixtures					Consumption of nutrients in mixtures and materials				
	N	P_2O_5		K_2O	Total N, available P_2O_5, and K_2O	N	P_2O_5		K_2O	Total N, available P_2O_5, and K_2O
		Available	Total				Available 1/	Total 2/		
Maine	14,347	20,593	21,192	21,378	56,318	15,137	21,202	21,833	21,552	57,89:
New Hampshire	1,238	2,071	2,152	2,203	5,512	1,682	2,547	2,655	2,285	6,514
Vermont	2,151	5,613	5,789	6,158	13,922	2,718	6,945	8,845	6,401	17,660
Massachusetts	9,198	7,189	7,491	6,986	19,313	8,718	8,410	8,779	7,420	22,548
Rhode Island	986	1,513	1,584	1,531	4,030	1,143	1,603	1,681	1,567	4,313
Connecticut	4,500	6,075	6,428	6,406	16,981	5,960	7,606	8,041	7,139	20,705
New England	28,420	43,054	44,636	44,602	116,076	33,352	49,913	51,834	46,366	129,631
New York	36,394	65,428	67,911	56,531	158,353	46,271	72,767	75,644	58,213	177,251
New Jersey	13,535	24,621	25,345	23,787	61,943	17,006	25,969	26,800	24,852	67,827
Pennsylvania	33,104	74,039	76,811	70,518	177,661	40,657	81,138	85,352	72,406	194,201
Delaware	5,085	10,213	10,574	11,501	26,799	6,126	10,323	10,698	11,677	28,086
District of Columbia	292	361	390	230	883	347	415	449	242	1,004
Maryland	15,650	32,817	35,219	31,547	80,014	19,517	34,062	36,979	32,052	85,631
West Virginia	3,100	8,013	8,583	7,069	18,182	3,688	9,806	10,453	7,200	20,696
Middle Atlantic	107,160	215,492	224,775	201,183	523,835	133,612	234,480	246,375	206,604	574,696
Virginia	29,649	75,848	80,956	80,592	186,089	44,735	79,829	85,245	84,150	208,714
North Carolina	63,448	129,426	139,515	146,473	339,347	134,223	133,773	144,451	154,801	422,794
South Carolina	27,242	65,316	70,785	67,117	159,675	71,840	67,956	73,656	77,905	217,727
Georgia	52,723	125,796	132,969	140,582	319,101	119,962	128,453	135,999	144,785	393,200
Florida	78,715	85,627	104,461	118,837	281,179	104,963	96,041	113,738	123,977	319,581
South Atlantic	251,777	482,013	528,686	553,601	1,287,391	475,723	500,658	553,089	585,640	1,562,021
Ohio	60,010	143,947	148,585	128,644	332,601	83,940	153,405	159,997	134,572	371,917
Indiana	59,592	154,600	158,937	148,137	366,529	123,157	167,184	174,716	189,024	479,365
Illinois	48,719	107,036	111,386	90,230	245,985	130,983	161,377	314,118	155,040	447,800
Michigan	41,846	103,702	107,095	96,691	242,239	59,751	108,370	112,905	101,039	269,160
Wisconsin	19,105	68,280	70,255	87,909	174,794	28,974	70,813	73,796	97,946	197,732
East North Central	229,272	577,565	596,258	551,311	1,358,148	426,805	661,149	835,528	677,621	1,765,575
Minnesota	24,378	84,796	86,685	62,303	171,437	63,610	108,762	111,557	70,722	243,094
Iowa	30,925	81,398	84,852	56,238	168,561	93,739	117,532	123,714	66,595	277,866
Missouri	53,450	74,215	77,642	67,611	195,276	110,912	90,887	161,315	78,659	280,458
North Dakota	6,180	11,010	11,329	1,511	18,701	18,033	43,697	44,726	1,519	61,749
South Dakota	1,568	2,480	2,656	191	4,239	7,698	7,548	7,933	209	15,475
Nebraska	4,875	11,016	11,147	1,670	17,561	121,063	25,415	26,068	2,113	148,591
Kansas	11,291	23,078	23,741	5,556	39,925	61,328	49,056	50,831	6,526	119,910
West North Central	132,667	287,953	298,052	195,080	615,700	476,383	442,897	526,144	226,363	1,145,643
Kentucky	26,327	57,310	62,093	60,042	143,679	44,717	68,667	76,504	68,989	187,373
Tennessee	28,278	57,814	62,072	56,778	142,870	53,980	64,236	69,661	65,494	183,710
Alabama	29,485	69,099	75,053	83,692	182,276	84,051	76,904	83,346	89,153	250,108
Mississippi	20,129	32,198	34,497	29,569	81,896	113,975	48,528	51,135	39,217	201,720
East South Central	104,219	216,421	233,715	230,081	550,721	296,723	258,335	280,646	262,853	817,911
Arkansas	11,442	25,444	26,647	24,994	61,880	65,611	11,710	33,202	43,994	141,315
Louisiana	11,395	21,852	23,042	18,209	51,456	55,109	24,945	26,968	20,266	100,320
Oklahoma	6,547	14,036	14,566	5,603	26,186	13,148	27,763	29,813	5,937	46,848
Texas	27,082	50,185	52,848	24,946	102,153	148,692	88,312	94,862	26,302	269,306
West South Central	56,406	111,517	116,503	73,752	241,675	282,560	172,730	184,845	96,499	551,789
Montana	464	653	677	144	1,261	5,085	12,741	13,121	164	17,990
Idaho	2,533	2,732	2,821	167	5,432	25,933	18,711	19,718	621	45,265
Wyoming	214	288	305	40	542	3,281	3,592	3,681	60	6,933
Colorado	1,889	2,849	3,010	1,081	5,819	20,202	15,344	15,666	1,505	37,051
New Mexico	326	414	444	103	841	7,871	8,308	8,611	145	16,324
Arizona	3,845	5,020	5,226	1,204	10,069	49,438	19,261	19,701	1,837	70,597
Utah	834	982	1,050	202	2,018	6,914	5,877	6,096	242	13,033
Nevada	277	294	317	66	637	986	783	817	72	1,841
Mountain	10,380	13,232	13,850	3,007	26,619	119,710	84,617	87,411	4,646	208,973
Washington	4,719	6,912	7,198	3,960	15,591	64,739	17,628	18,148	7,068	89,435
Oregon	2,990	4,899	5,081	2,686	10,575	41,689	13,887	14,445	3,843	59,419
California	37,258	38,940	39,767	21,279	97,477	3/266,352	3/94,067	3/96,928	4/33,110	393,589
Pacific	44,967	50,751	52,046	27,925	123,643	372,780	125,582	129,521	44,021	542,383
Total	965,268	1,997,998	2,108,521	1,880,542	4,843,808	2,617,648	2,530,361	2,895,393	2,150,613	7,298,622
Hawaii	6,970	4,525	4,639	10,995	22,490	19,333	9,024	10,442	18,603	46,960
Puerto Rico	27,725	11,792	13,504	22,768	62,285	35,351	11,902	13,615	22,878	70,131
United States:										
1958-59	999,963	2,014,315	2,126,664	1,914,305	4,928,583	2,672,332	2,551,287	2,919,450	2,192,094	7,415,713
1957-58	855,204	1,798,590	1,903,452	1,683,910	4,337,704	2,284,359	2,292,890	2/2,655,300	1,935,138	6,512,987
1956-57	843,626	1,817,626	1,926,774	1,681,121	4,342,373	2,135,287	2,304,992	2,669,942	1,930,963	6,377,00:

1/ Includes, for quantities marketed as direct-application materials, an average content of 2 percent for the colloidal phosphate and 3 percent for the phosphate rock. 2/ Includes, for quantities marketed as direct-application materials, an average content of 22.0% percent for the colloidal phosphate and 32.0% percent for the phosphate rock. 3/ Includes an estimate of 4,185 tons marketed as dried manures. 4/ Includes an estimate of 7,452 tons marketed as dried manures. 5/ Revised by addition of 41 tons in Rhode Island.

TABLE 12. CHANGE IN CONSUMPTION OF PRIMARY NUTRIENTS, year ended June 30, 1959, compared with preceding year

Tons

State and region	Mixtures					Materials				
	N	P_2O_5		K_2O	Total (N, avail. P_2O_5, and K_2O)	N	P_2O_5		K_2O	Total (N, avail. P_2O_5, and K_2O)
		Available	Total				Available	Total		
Maine	411	121	50	-632	-100	193	-453	-452	59	-201
New Hampshire	146	24	36	-6	164	90	12	23	-30	72
Vermont	220	-544	-597	-449	-773	83	-154	-127	65	-6
Massachusetts	272	-41	-27	212	443	78	124	60	52	254
Rhode Island	29	-76	-73	-49	-96	-23	4	-1	-5	-24
Connecticut	671	207	277	312	1,190	-54	-32	-51	-37	-163
New England	1,749	-309	-294	-612	828	367	-499	-548	104	-28
New York	-33	-989	-1,028	-603	-1,625	219	-293	-383	-34	-108
New Jersey	2,528	3,577	3,650	3,339	9,444	548	47	37	488	1,083
Pennsylvania	2,358	2,406	2,486	3,183	7,947	1,025	114	-21	576	1,715
Delaware	952	1,116	1,118	1,797	3,865	259	-5	-52	32	286
Dist. of Col.	69	77	90	69	215	2	9	12	2	13
Maryland	2,966	3,393	4,142	4,225	10,584	1,194	222	250	83	1,499
West Virginia	145	132	141	225	502	-54	431	469	9	386
Mid. Atlantic	8,985	9,712	10,599	12,235	30,932	3,193	525	812	1,156	4,874
Virginia	3,296	7,389	7,940	11,343	22,028	2,236	923	725	679	3,838
North Carolina	9,346	15,727	16,951	19,417	44,490	14,252	802	1,127	854	15,908
South Carolina	5,551	12,393	14,092	13,503	31,447	8,705	58	31	1,257	10,020
Georgia	9,075	19,794	20,890	27,759	56,628	10,717	-1,467	-2,601	102	9,352
Florida	874	-1,902	-2,202	2,004	976	323	49	770	790	1,162
So. Atlantic	28,142	53,401	57,671	74,026	155,569	36,233	365	52	3,682	40,280
Ohio	6,354	6,759	5,062	2,534	15,647	6,402	972	271	254	7,628
Indiana	7,596	10,852	10,585	13,286	31,734	18,879	1,022	-1,878	-2,251	17,650
Illinois	11,122	22,684	23,374	10,541	44,347	23,189	863	-3,543	4,409	28,461
Michigan	7,378	11,079	10,916	9,924	28,381	4,940	518	348	-608	4,850
Wisconsin	1,617	3,803	2,934	7,302	12,722	1,164	-279	-249	4,040	4,905
East No. Cent.	34,067	55,177	52,871	43,587	132,831	54,574	3,096	-5,051	5,844	63,514
Minnesota	5,121	15,449	15,196	14,659	35,229	9,041	135	127	1,046	10,222
Iowa	7,568	17,850	18,621	12,629	38,047	20,780	6,847	6,863	1,964	29,591
Missouri	15,103	17,394	18,182	18,092	50,589	11,866	1,731	7,893	-139	13,458
North Dakota	2,137	2,203	2,280	-161	4,179	2,973	5,011	5,940	6	7,990
South Dakota	152	37	44	47	236	1,184	-96	-37	22	1,110
Nebraska	1,456	3,728	3,767	371	5,555	25,453	1,887	1,932	222	27,562
Kansas	3,488	6,583	6,703	2,111	12,122	18,343	5,009	5,490	368	23,714
West No. Cent.	35,025	63,184	64,793	47,748	145,957	89,640	20,524	27,608	3,483	113,647
Kentucky	3,597	5,284	5,826	6,761	15,642	3,186	2,370	2,114	1,348	6,904
Tennessee	5,499	9,100	9,641	10,254	24,853	5,574	-473	136	1,353	6,454
Alabama	4,447	-8,523	-7,850	11,889	7,813	7,545	-1,119	-1,741	307	6,733
Mississippi	4,464	6,729	7,132	8,443	19,636	1,191	1,965	187	938	4,094
East So. Cent.	18,007	12,590	14,749	37,347	67,944	17,496	2,743	696	3,946	24,185
Arkansas	2,227	4,683	4,870	5,957	12,867	10,763	737	779	4,857	16,357
Louisiana	1,059	1,815	1,911	1,235	4,109	218	-274	-715	241	185
Oklahoma	1,801	3,438	3,537	1,314	6,553	1,447	3,774	4,142	40	5,661
Texas	2,593	1,877	2,012	8,442	12,047	1,576	-281	105	-222	977
West No. Cent.	7,680	13,773	14,195	10,518	31,971	14,004	3,956	4,311	4,816	22,776
Montana	-156	-279	-292	84	-351	783	1,056	1,077	-13	1,826
Idaho	1,049	1,116	1,137	-31	2,134	2,897	3,610	3,763	-169	6,138
Wyoming	27	1	1	12	40	443	571	592	16	1,030
Colorado	148	219	220	-20	347	1,819	775	797	110	2,704
New Mexico	-9	-150	-146	-16	-175	-671	899	981	-41	187
Arizona	-539	-914	-938	-62	-1,515	1,537	25	32	68	1,600
Utah	462	354	378	-2	814	-1,140	-1,004	-1,046	6	-2,180
Nevada	44	54	68	6	104	16	-195	-210	-8	-187
Mountain	1,026	401	428	-29	1,398	5,684	5,707	5,985	-31	11,360
Washington	449	256	278	-76	629	-2,039	-4	-99	818	-1,225
Oregon	175	301	319	244	720	2,009	980	1,018	48	3,077
California	4,020	4,210	4,267	1,409	9,619	21,746	3,937	4,868	845	28,549
Pacific	4,644	4,767	4,864	1,577	10,988	23,716	4,913	5,807	1,711	30,340
Total	139,325	212,696	219,876	226,397	578,418	-244,907	41,330	39,172	24,711	310,948
Hawaii	-586	1,116	1,079	-149	381	2,002	1,611	2,039	1,918	5,521
Puerto Rico	6,020	1,913	2,257	4,147	12,080	-3,695	-269	-273	-68	-4,036
United States	144,759	215,725	223,212	230,395	590,879	-244,314	42,672	40,938	26,561	312,447

GARMAN REPORT

on fertilizer use and grasslands in Western Europe

Dr. Willard H. Garman, chief agronomist for the National Plant Food Institute, recently attended the Eighth International Grassland Congress and visited six European countries. This is the first of two articles concerning his findings about "fertilizer use and grasslands in Europe."

AVERAGE use of fertilizer in Western Europe is slightly more than four times that of the United States, when compared on the basis of acres of agricultural land. Western Europe averages 49 pounds of plant foods per acre for its 368 million acres of agricultural land, whereas the average for the U. S. is only 12 pounds for its 1.1 billion acres of agricultural land.

Here is the estimate of the economic optimum rate of plant food use for certain countries of Europe by the Organization for European Economic Cooperation:

ECONOMIC OPTIMUM PLANT FOOD USE

Country	Use of N-P_2O_5-K_2O on Agricultural Land: Present	*Optimum	Change
	Lbs./A	Lbs./A	%
Belgium	180	220	22
Denmark	106	142	34
Sweden	67	95	60
United Kingdom	47	78	65
France	46	163	255
Holland	175	162	−7

* Calculated from data of Walsh & Kilroy, EPA, Organization for European Economic Cooperation, Paris, 1959, as reported by Page in "Outlook for Agriculture," Vol. II, No. 5, 1959.

One of the most outstanding contributions which I heard at the Eighth International Grassland Congress was by Dr. John B. Washko and Dr. L. F. Marriott of the U. S. Both are professors of agronomy at the Pennsylvania State University, and Dr. Washko—the senior author—is president of the American Grassland Council.

The major result of their report was that adequately fertilized grasses, such as smooth bromegrass, orchardgrass, reed canarygrass, and timothy, produced yields of forage and protein equal to, and sometimes higher than, those obtained with legumes and legume-grass mixtures.

In addition to presenting results of Pennsylvania research, Dr. Washko referred to research findings from other areas in northeastern United States. He emphasized that results from various states appear to be in general agreement that 200 pounds of N can be profitably used on grasses in the Northeast, providing the mineral nutrients and lime are present in adequate amounts.

The first 100 pounds appears more efficient in terms of dry matter production, while the second 100 pounds gives a proportional increase in percentage of protein. ▲

TABLE 13. PRIMARY PLANT NUTRIENTS CONSUMED as mixtures and as direct-application materials, by kinds, year ended June 30, 1959

Tons

Kind	New England	Middle Atlantic	South Atlantic	East North Central	West North Central	East South Central	West South Central	Mountain	Pacific	Hawaii and Puerto Rico	United States
Nitrogen											
MIXTURES: N-P-K	28,414	107,097	221,582	224,060	109,696	101,042	51,797	4,305	31,397	30,122	909,512
N-P	6	40	290	5,189	22,962	2,496	4,350	6,072	13,252	79	54,736
N-K	0	23	29,905	23	9	681	259	3	318	4,494	35,715
MATERIALS:											
Ammonia, anhydrous	0	2,482	23,376	72,152	138,395	49,696	119,746	37,368	115,319	644	559,178
" , aqua	0	1/	0	2,467	2,836	1,292	1,383	5,939	72,711	10,312	96,940
Ammonium nitrate	1,746	11,701	52,516	54,458	112,132	98,103	41,176	25,881	31,706	0	429,419
Ammonium nitrate-limestone mixtures	12	288	54,735	94	6	7,865	524	43	65	5,863	69,495
Ammonium sulfate	92	1,481	1,775	23,785	2,002	2,328	17,269	12,472	47,653	0	109,457
Bonemeal: raw and steamed	44	112	42	54	8	12	14	1	68	0	355
Calcium cyanamide	138	1,473	1,373	167	0	1,510	1,654	127	1,575	0	8,617
Calcium nitrate	2	1/	1,784	0	0	183	69	1,267	4,753	16	8,074
Natural organics	1,267	1,801	1,615	2,177	809	121	243	281	6,145	8	14,467
Nitrogen solutions	447	2,120	39,415	30,232	57,852	4,755	8,017	3,648	12,538	0	159,024
Phosphate products	2	203	141	2,591	27,148	611	16,194	13,953	22,064	517	83,424
Potassium products	16	1/	2,896	1/	1/	101	0	0	1	1	3,015
Sodium nitrate	275	1,879	42,062	194	53	23,646	9,253	49	34	20	77,475
Urea	720	2,251	1,304	8,189	2,270	1,648	10,514	8,023	12,672	2,606	50,197
Other chemical nitrogen products	171	661	312	973	195	33	98	278	509	2	3,232
Total nitrogen	33,352	133,612	475,723	426,805	476,383	296,723	282,560	119,710	372,780	54,684	2,672,332
Available P_2O_5											
MIXTURES: N-P-K	38,578	194,114	455,524	517,048	222,806	186,170	95,451	6,216	35,188	15,103	1,766,198
N-P	7	114	130	20,394	47,500	1,193	8,254	7,003	15,166	230	99,991
P-K	4,469	21,264	26,359	40,123	17,647	29,058	7,812	13	397	984	148,126
MATERIALS:											
Ammonium phosphate: 11-48	0	659	17	6,926	26,560	0	2,270	5,224	7,543	679	49,878
" " 13-39	0	0	0	148	9,638	4	6,493	1,812	2,347	0	20,442
Ammonium phosphate sulfate: 16-20	0	0	0	65	19,810	84	17,272	11,823	20,783	81	69,918
Ammonium phosphate nitrate: 27-14	0	0	0	0	452	1	1	562	1,308	0	2,324
Basic slag	0	0	1,653	2	0	10,453	196	0	0	0	12,304
Bonemeal: raw and steamed	379	1,002	447	408	61	105	92	8	379	0	2,881
Calcium metaphosphate	0	334	1,701	2,335	13,962	9,327	199	125	19	0	28,002
Diammonium phosphate: 21-53	5	113	344	2,257	3,037	1,394	560	5,085	1,018	761	14,574
Natural organics	806	1,093	669	2,163	803	73	842	195	5,686	7	11,637
Phosphate rock and colloidal phosphate	11	202	516	15,851	7,118	476	580	6	54	124	24,938
Phosphoric acid	0	0	0	0	95	0	1,262	5,022	5,923	0	12,302
Potassium products	14	1/	6	0	1/	1/	0	0	0	0	20
Superphosphate: 22% and under	5,439	14,738	10,367	11,298	9,336	17,160	12,604	3,219	16,936	1,176	102,273
" over 22%	176	847	2,761	42,006	64,072	2,837	19,533	38,304	12,471	1,745	184,752
Other phosphate products	29	0	164	125	0	0	9	0	364	36	727
Total available P_2O_5	49,913	234,480	500,658	661,149	442,897	258,335	172,730	84,617	125,582	20,926	2,551,287
K_2O											
MIXTURES: N-P-K	38,500	177,415	479,415	496,163	178,538	197,620	65,301	2,994	27,288	26,037	1,689,271
P-K	6,102	23,744	40,073	55,124	16,533	31,597	8,192	11	430	1,235	183,041
N-K	0	24	34,113	24	9	864	259	2	207	6,491	41,993
MATERIALS:											
Lime-potash mixtures	0	1	1,293	1/	0	470	0	0	0	0	1,764
Manure salts	0	0	98	0	0	0	15	0	0	0	113
Natural organics	324	447	371	592	108	30	75	54	8,014	1	10,016
Potassium chloride	1,133	3,851	24,400	123,705	30,747	28,729	22,258	957	4,288	6,772	246,840
" magnesium sulfate	20	274	618	455	209	279	291	33	392	2	2,573
" nitrate	57	0	47	1	0	0	0	0	1	0	106
" sodium nitrate	0	0	2,733	0	0	97	23	0	1/	1	2,854
" sulfate	64	841	2,330	1,540	215	3,167	3	595	3,399	942	13,096
Other potassium products	166	7	149	17	4	1/	82	0	2	0	427
Total K_2O	46,366	206,604	585,640	677,621	226,363	262,853	96,499	4,646	44,021	41,481	2,192,094
GRAND TOTAL: N, avail. P_2O_5, K_2O	129,631	574,696	1,562,021	1,765,575	1,145,643	817,911	551,789	208,973	542,383	117,091	7,415,713

1/ Less than 0.5 tons.

Alphabetical List of Advertisers

New Road to Growth

The poisonous pens of farm chemicals' critics have left their mark on Lancaster county, Pennsylvania, as with any farming area. Old wives' tales about mass poisoning of the populace by chemicals in our foods probably receive the same reaction in this home of the "old hoss shay" as in neighboring Philadelphia.

But here's a story of *service* that few "scare artists" would dare to touch—the story of the Pennsylvania Dutch of Lancaster county and MH-30!

Lancaster county is known for its God-fearing, but thoroughly *practical*, rural citizenry. You've read about certain religious sects which shun tractors and other labor-saving machines. They prefer to work by the sweat of their brow.

But apparently many farmers draw the line when it comes to such *impractical*, back-breaking chores as hand-suckering the tobacco crop.

Lancaster Farming, a weekly newspaper reported on June 11 that "A June first news release from the United States Department of Agriculture cautions against the use of Maleic Hydrazide (MH-30) for the control of sucker growth on tobacco."

The USDA acted, the report said, after it had received numerous strong protests against the chemical from the major tobacco companies.

"The USDA apparently is worried that the use of the chemical could seriously jeopardize the tobacco price support program as well as the domestic and foreign markets for United States tobacco."

Leaving little doubt as to how the newspaper stood on the matter, *Lancaster Farming* continued:

"The buying companies readily admit that treated tobacco, in many cases, does not show adverse physical effects that can be detected on the auction floor," reports *Lancaster Farming*.

"If the tobacco companies intend to discriminate against the chemically treated tobacco, they made a poor start last season. There will be many more farmers willing to test them out again this year," the newspaper's editorial concluded.

We think it's high time that farm chemicals manufacturers took the offensive. But a *new state of mind* is needed by the industry before it can ever hope to change the image of its products.

Here's the story the industry ought to be telling:

Pesticides are not just pesticides! Fertilizers are not just fertilizers!

Roger M. Blough, chairman U. S. Steel Corporation, in writing about his favorite product (Oops! we mean *service*) in a recent issue of the *New York Herald Tribune*, outlined the kind of philosophy needed in the farm chemicals industry.

Growth Grows on Service

"Growth is a popular word these days. Some nations are said to be growing while others are thought to be mature. People talk about growth industries and growth companies as if certain industries or companies were almost predestined by events to continue expanding while other industries or companies, presumably, were fated to stand still or decline—despite anything they might do to prevent it.

"The fact is, of course, that any industry or company will continue to grow if it continues to serve well the changing needs and wants of people.

"*We know that markets are not just some pit into which our production can be dumped. Markets are people—people who buy our products and the things made from our products.*

"What is more, these people have a choice and it is our marketing job—it is our whole management job—to do the things that will make them want to choose our product. Fulfilling people's aspirations and desires is the only meaningful way to growth in a free economy.

"That is why steel is no longer just steel. There are today literally more than ten thousand different types of steel. And they serve thousands of different human needs."

Mr. Blough goes on:

". . . nowhere in the steel business today are we selling just so many pounds of material. We are selling value, accomplishment of jobs that need to be done, strength, beauty, long life, convenience and many other qualities which make our products of use to our customers and their customers. Yes, we are truly trying to lighten the work, brighten the leisure and widen the world of millions of people."

"Others may see the steel industry as a heavy, basic industry. But we see it as a tremendously exciting adventure in serving people—through science, art, technology, management and all the skills and resources required to serve human needs.

"All of these needs are changing constantly, and these changes bring both problems and opportunities. We cannot foretell the future, but we can develop a state of mind that will help mould our business to that future.

"We see the opportunity for continued growth by our company and continued service to our country's people as really one and the same."

GORDON L. BERG

EXPANDA-KRAFT (newest, high-strength H&W bag stock) stops a Johnny Unitas pass

Johnny Unitas, all-pro quarterback, throws fast and hard and straight. We asked Johnny to help us demonstrate the strength and resilience of Expanda-Kraft. He had two targets: regular multiwall kraft and Expanda-Kraft. Each target had four plies of 50-lb. stock. The speeding pigskin ripped through regular kraft, but time after time it bounced off Expanda-Kraft. The picture shows where the ball left dents in the Expanda-Kraft.

Multiwall bags made of Expanda-Kraft:

Reduce breakage—Expanda-Kraft bags have two-way stretch, soak up shocks that would break ordinary kraft bags of equal basis weight.

Stack securely—They stack with less risk of slippage and stay in place while in transit, because of improved friction coefficient when compared with regular kraft bags.

Withstand moisture—Weathering and high humidity have little effect. They stay tough. Firm.

Print sharp—Their attractiveness increases your product's sales appeal. Expanda-Kraft White is unusually bright and takes fine printing beautifully. Semi-bleached and Natural shades do, too.

Fill fast—Expanda-Kraft bags have high porosity. And they're rigid enough to stand up to high production speeds on the filling line.

Expanda-Kraft, made by a new roll-crepe process, withstood the terrific impact of these Johnny Unitas bullet passes. It combines rigidity and moisture resistance with uniform toughness. Expanda-Kraft is available to multiwall bag manufacturers in 40, 50, 60, 70 and 80-lb. basis weights. Expanda-Kraft bags have proved their superiority over regular kraft bags in standard drop tests.

Expanda-Kraft is superior to regular kraft in impact test. These bags were filled with sand, suspended on long ropes, released and collided in mid-air. Only the regular kraft bag burst, yet it had the same ply construction as the Expanda-Kraft bag.

Contact your multiwall bag supplier for more information. Or, write *Hollingsworth & Whitney, Division of Scott Paper Company, Chester, Pennsylvania.*

SAFEGUARD YOUR PRODUCT IN EXPANDA-KRAFT*

*T.M. Scott Paper Company

HOLLINGSWORTH & WHITNEY DIVISION OF
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NEW PRODUCTS MEAN NEW PROFITS

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THIODAN
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ETHION
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TEDION
ETHION
THIODAN

Nothing rings the register more often than a hot new ag chemical—and—Niagara has *three*, all granted wider registration this season because they provide answers to serious pest control problems:

TEDION®—the ideal miticide growers have been looking for. Highly effective *and* specific, it kills even resistant mites, but doesn't harm mite predators.

ETHION. An unusual pesticide that has both miticidal and insecticidal properties. It's a quick-acting phosphate, won't injure foliage.

THIODAN®. A powerful broad-range insecticide that is particularly effective against aphids and kills many other important insects on a variety of crops.

Farmers will enter your store looking for these Niagara products because they know about them . . . from strong advertising campaigns and publicity in farm magazines, from direct mail, from outdoor advertising, from displays at important grower meetings—all part of Niagara promotion.

These products of advanced research joining Niagara's profit makers of previous years—such as Niacide and Kolo fungicides, Bedrench Soil sterilant—keep the Niagara line second to none for completeness. For information write to:

Niagara

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Niagara Chemical Division • Middleport, N. Y.